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ABSTRACT

Guides for organizing and individualizing three courses of study for job training in the mining careers of entry level miner, general inside laborer/timber framer, and faceman are presented in this manual. Introductory information includes (1) suggestions for utilizing, modifying, or customizing materials (task sheets) in the manual to suit individual student needs; (2) directions for maintaining records and creating student textbooks; (3) a title glossary which lists all the tasks presented in the manual, grouping them into twenty-two modules, which are further grouped into six larger instructional units: entry level orientation, safety, mine emergencies, roof rib control, communications, and ventilation and air control; and (4) groupings of task titles according to their appropriateness for each of the three courses of study. The remainder of the manual presents ninety-five task sheets designed for the student and representing the core of skills needed (as recommended by mining and vocational education personnel) in most deep mining operations. Each task sheet includes the task title, instructional objectives, procedures, review questions, accompanying information sheets, and related illustrations. (BM)

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ED146419

MINING CAREERS

INSTRUCTOR'S MANUAL
AND
STUDENT'S BASIC COURSE OF STUDY

Recommended Courses
For

ENTRY LEVEL MINER

GENERAL INSIDE LABORER

TIMBER FRAMER

FACE WORKER

U S DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

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CE 013 527

It is the policy of the Admiral Peary Area Vocational-Technical School Board to acknowledge persons whose leadership in their vocational fields contributed significantly to the development and enhancement of curricula content and teaching methods.

A DEBT OF GRATITUDE IS DUE:

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LONGWALL MINING CO.

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Acknowledgement must also be given to the many people who have contributed to the development of these materials, and to those who will continue to refine and improve vocational and career development programs for students of all ages.

Bryan V. Fluck
Executive Director

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DEEP MINING CAREERS

JOB CLASSIFICATION	GENERAL MINING	MINE CONSTRUCTION	MACHINE OPERATION	MINE MECHANICS/ MAINTENANCE	MINE ELECTRICITY
CLASS. V			1. Continuous Miner Operator 2. Longwall Operator 3. Roof Bolter	1. Mechanic 2. Welder 1st Class	1. Electrician
CLASS. VI			1. Driller Operator 2. Cutting Machine Operator 3. Loading Machine Operator 4. Machine Operator Helper 5. Continuous Miner Helper 6. Roof Bolter Helper	1. General Inside Repairer 2. Maintenance Trainee II	1. Electrician Trainee
CLASS. III	1. Face Worker	1. Precision Mason	1. Dump Operator 2. Shuttlecar Operator 3. Driller 4. Shooter		
CLASS. II			1. Motor Operator (Motorman)	1. Maintenance Trainee I 2. Mechanic Helper	1. Electrician Helper
CLASS. I	1. General Inside Laborer 2. Timber Framer (Timberman) 3. Unskilled Laborer	1. Stopping Builder (Bratticeman)	1. Braker (Brakeman)	1. Bonder 2. Wirer (Wireman) 3. Pumper 4. Belt Repairer (Beltman) 5. Track Layer (Trackman)	

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PREFACE

Introduction

The Admiral Peary Area Vocational-Technical School in Ebensburg, Pennsylvania, was conceived as a curricula development center, as well as a center for vocational and career education. Under several grants from various sources, and with the encouragement of the public and their elected school board officials who are highly supportive of vocational education and its growth potential, a wide range of curriculum materials have been prepared. The intent of these materials is to assist instructors, and the administrative staff supporting them, in developing and delivering truly individualized competency-based courses of study for students and industry.

A Message to the Instructor

The curriculum system and materials presented in this manual, and the accompanying compilation of Mining task sheets, are not intended as directives on "how to teach" or even "what to teach". The primary intent is to supply instructors with methods by which course content can be organized and individualized to the occupational and career goals of the students. The manual illustrates these methods by presenting four Mining Careers vocational education program models: Entry Level Miner, General Inside Laborer, Timber Framer, and Faceman.

Also illustrated is the flexibility of the system:

--In meeting changes in individual goals;

--In presenting the student with an understanding of the mining occupations and the skills that are common, or different, to each occupation;

--In providing a means by which any type of mining course for any type of student can be easily and quickly created.

The occupational titles (taken largely from the _Dictionary of Occupational Titles_ published by the U.S. Department of Labor) are only suggested titles for use in a vocational education program. The task groupings assigned each occupational title are only suggested groupings.

This manual contains recommended sets of tasks for the occupational titles of _Entry Level Miner_, _General Inside Laborer_, _Timber Framer_, and _Faceman_. The tasks were compiled and evaluated by both mining and vocational-education personnel. These task groupings are by no means intended as a complete listing of all the skills needed in these general mining occupations. Individuals and companies may wish to incorporate other tasks into the course of study which are not contained in these recommended groupings. Certain tasks may be deleted or revised. The task groupings contained in this manual for each occupational title represent the core of skills needed in most deep mine operations.

This manual provides a method by which any task can be added to or deleted from, the sets contained herein. In other words, the instructor is encouraged to design his or her own courses using the task groupings in this manual as a guide.

The instructor is the primary person responsible for developing the content of any course of study. The system presented here simply provides the instructor with the means of breaking away from the constraints of the textbook:

--Constraints which do not consider differences in students' backgrounds and learning paces;

--Constraints which do not allow for the instructor's own beliefs as to the content emphasis and organization which are unique to various occupational areas within or related to mining;

--Constraints which do not allow for the variances in skills sought by the industries within a particular geographic area.

Essentially, the system presented here allows the instructor to co-author, with the student, a different textbook for each student. The system also allows the instructor to co-auther, with industry, a different textbook for the particular needs of each industrial organization. Each student's textbook is built on individual learning fields of interest, while still providing direction towards specific occupational goals. The system provides the instructor with a record of tasks performed by the student; it provides the student with a well organized reference manual relating to his or her occupational choice (course of study); and it provides the prospective employer with an excellent understanding of the skills possessed by the student.

GUIDE TO USAGE

COURSE DESIGN AND CONTENT

In this manual the Instructor will find three (3) recommended courses of study:

Course I Entry Level Orientation

This course can be found on Page 37 of this manual.

Course II General Inside Laborer/Timber Framer

This course can be found on Page 41 of this manual.

Course III Faceman

This course can be found on Page 45 of this manual.

The Instructor should be aware that, by using the materials contained in this manual, the individual student or sponsoring company can be provided with two options in determining a course of study.

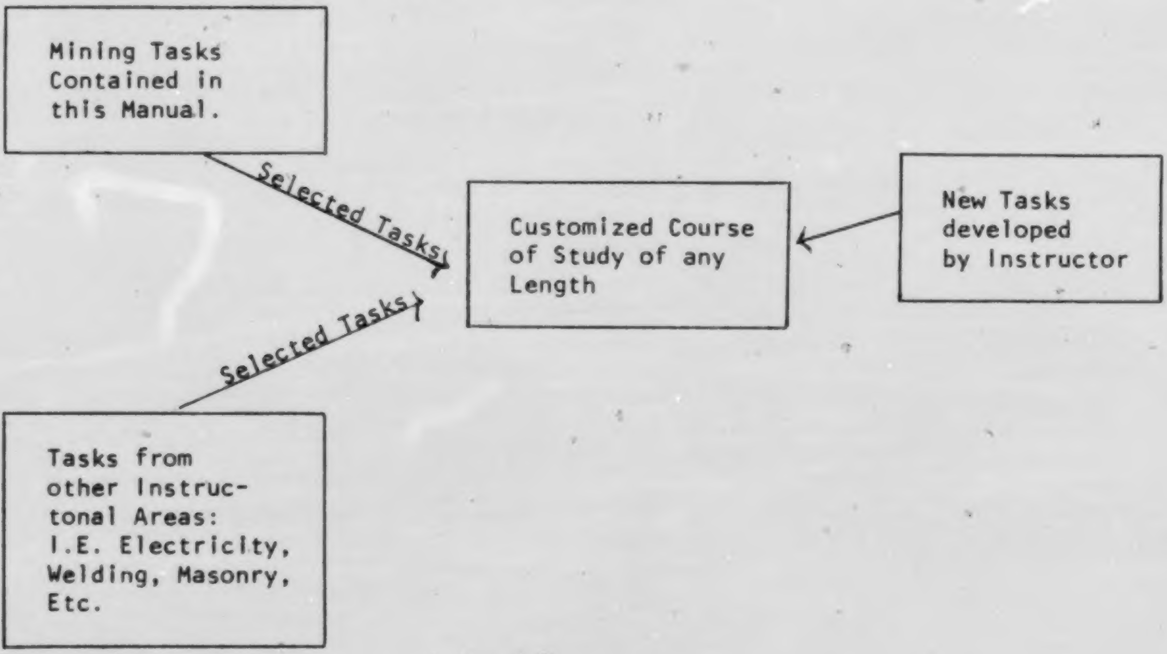
Option I Using the Recommended Courses of Study

Example: General Inside Laborer

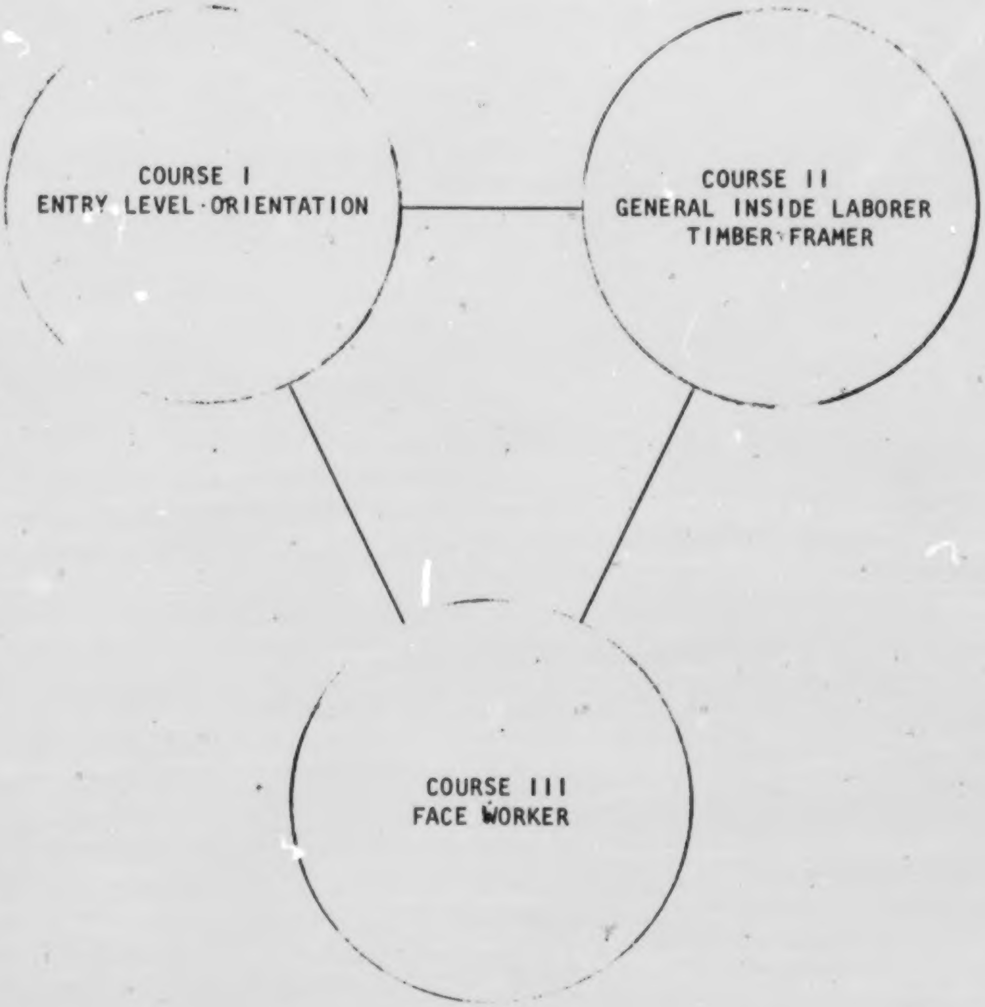
Course I
General Inside Laborer

This course can be found on Page 41 of this manual.

Option II Customizing a Course of Study


Mining Tasks Contained in this Manual.
Selected Tasks
Customized Course of Study of any Length
New Tasks developed by Instructor
Selected Tasks
Tasks from other Instructonal Areas: I.E. Electricity, Welding, Masonry, Etc.

USING THE TWO OPTIONS
-- OPTION I --
THE RECOMMENDED COURSE OF STUDY


COURSE I
ENTRY LEVEL ORIENTATION
COURSE II
GENERAL INSIDE LABORER
TIMBER FRAMER
COURSE III
FACE WORKER

Using the Two Options
-- Option I --
The Recommended Course

The recommended courses contained in each of the Mining manuals, are developed around major occupational titles recognized by the Department of Labor and the Mining Industry. Course I, Entry Level Orientation, is the only course in the series which does not relate to a specific mining title, but rather to the unique orientation requirements of the new miner.

The recommended courses are comprised of units of learning called Tasks, and each task contained in this manual is listed in the Task Title Glossary on pages 23 - 33 ; and each Task Sheet can be found at the back of the manual.

The recommended courses list the tasks, taken from the Task Title Glossary, which the mining industry most often selected as necessary to the particular occupational title. Therefore, for example, Course II (General Inside Laborer) which is found on page 41, lists all the tasks recommended to obtain competency in the occupational position of General Inside Laborer.

The tasks are listed in a logical order for teaching, but the Instructor will find that many other orders of instruction will also work. Students need not all work on the same tasks at the same time, nor do they necessarily need to accomplish each task at the same rate. Each student should, however, be able to perform each task with nearly the same proficiency.

The Instructor should examine each recommended course of study and determine its suitability for the training which he or she is being asked to provide. For a number of reasons, including convenience, the tasks have been grouped into modules, and modules have been grouped into units. By examining unit and module titles the Instructor can get a quick overview of what is contained in each recommended course.

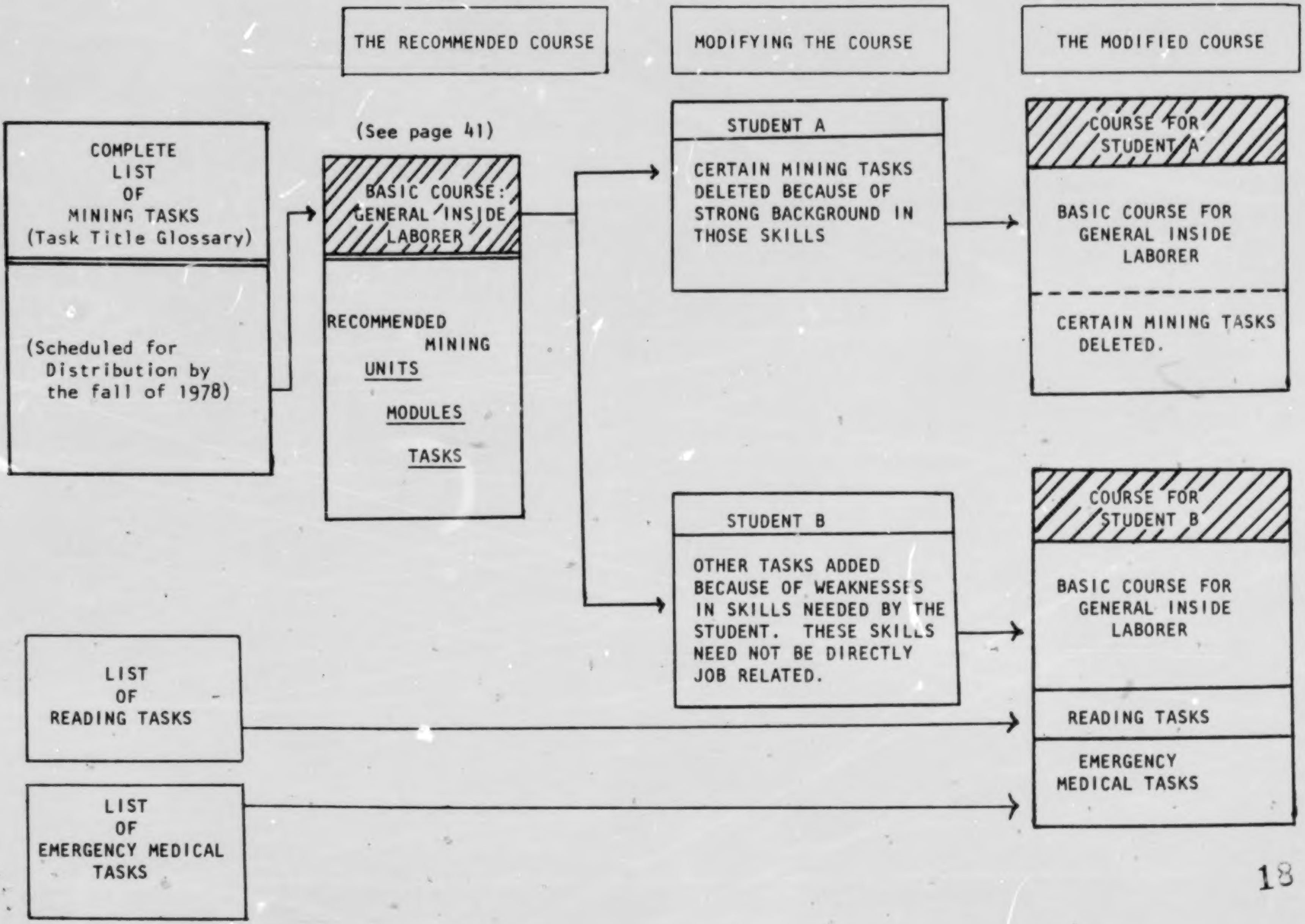
If the Instructor determines that the recommended course of study will be used, he or she should be aware that this course can still be easily modified to match variances in backgrounds and abilities in individual students. Three common reasons for modifying the recommended course are:

1. Differences in Backgrounds (Education and/or Work Experience)
2. Variances in Occupational Goals and Needs
3. Variances in the Work Operations of Each Company

The following pages illustrate how the recommended course can be modified to meet examples of each of the differences listed above.

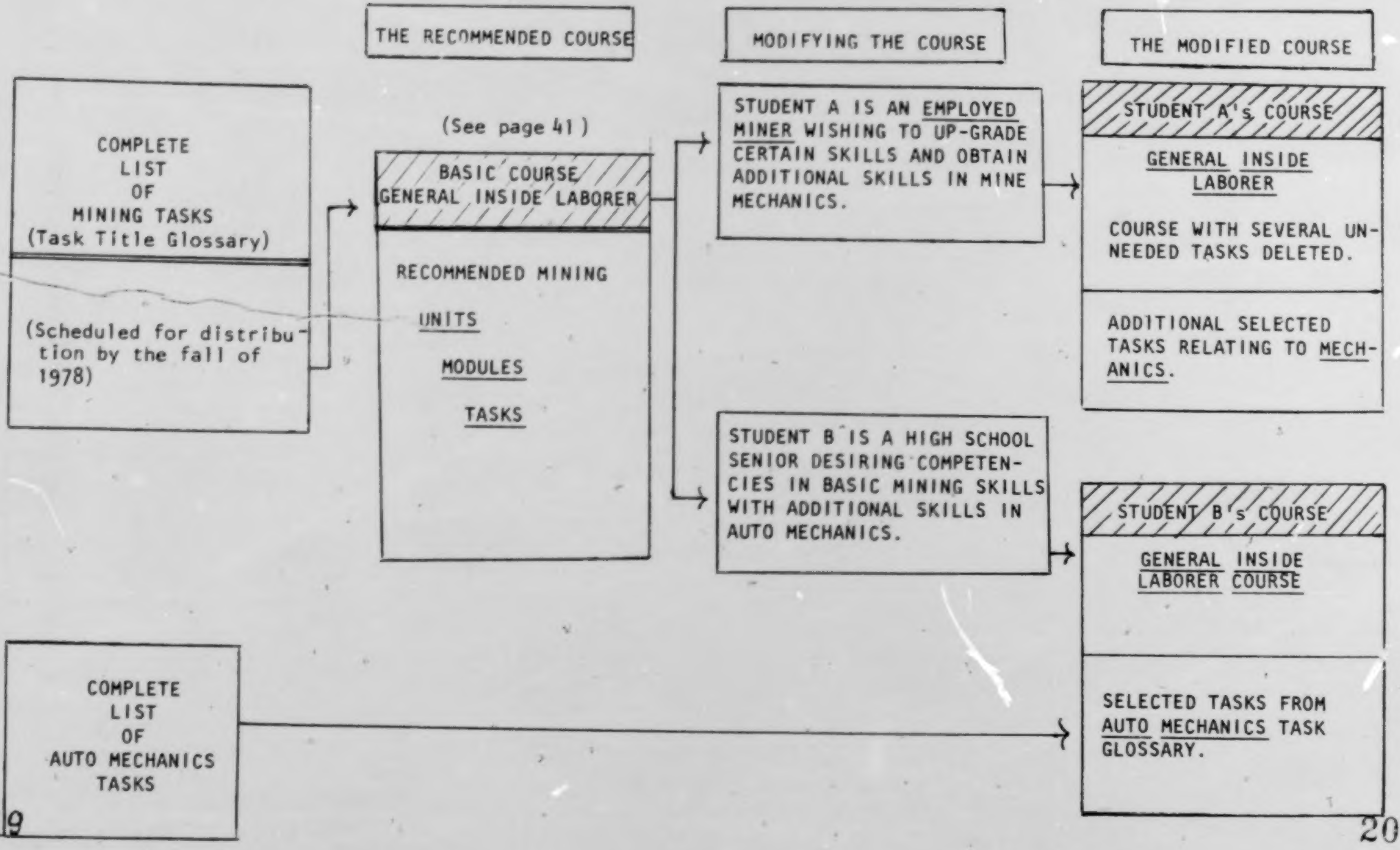
EXAMPLE I

MODIFYING TO STUDENT'S BACKGROUND


THE RECOMMENDED COURSE
MODIFYING THE COURSE
THE MODIFIED COURSE
COMPLETE LIST OF MINING TASKS (Task Title Glossary)
(Scheduled for Distribution by the fall of 1978)
(See page 41)
BASIC COURSE: GENERAL INSIDE LABORER
RECOMMENDED MINING
UNITS
MODULES
TASKS
STUDENT A
CERTAIN MINING TASKS DELETED BECAUSE OF STRONG BACKGROUND IN THOSE SKILLS
COURSE FOR STUDENT A
BASIC COURSE FOR GENERAL INSIDE LABORER
CERTAIN MINING TASKS DELETED.
STUDENT B
OTHER TASKS ADDED BECAUSE OF WEAKNESSES IN SKILLS NEEDED BY THE STUDENT. THESE SKILLS NEED NOT BE DIRECTLY JOB RELATED.
COURSE FOR STUDENT B
BASIC COURSE FOR GENERAL INSIDE LABORER
READING TASKS
EMERGENCY MEDICAL TASKS
LIST OF READING TASKS
LIST OF EMERGENCY MEDICAL TASKS

EXAMPLE II

MODIFYING TO STUDENT'S GOALS AND NEEDS



COMPLETE LIST OF MINING TASKS (Task Title Glossary)

(Scheduled for distribution by the fall of 1978)

(See page 41)

BASIC COURSE GENERAL INSIDE LABORER

RECOMMENDED MINING

UNITS

MODULES

TASKS

STUDENT A IS AN EMPLOYED MINER WISHING TO UP-GRADE CERTAIN SKILLS AND OBTAIN ADDITIONAL SKILLS IN MINE MECHANICS.

STUDENT B IS A HIGH SCHOOL SENIOR DESIRING COMPETENCIES IN BASIC MINING SKILLS WITH ADDITIONAL SKILLS IN AUTO MECHANICS.

STUDENT A's COURSE

GENERAL INSIDE LABORER

COURSE WITH SEVERAL UNNEEDED TASKS DELETED.

ADDITIONAL SELECTED TASKS RELATING TO MECHANICS.

STUDENT B's COURSE

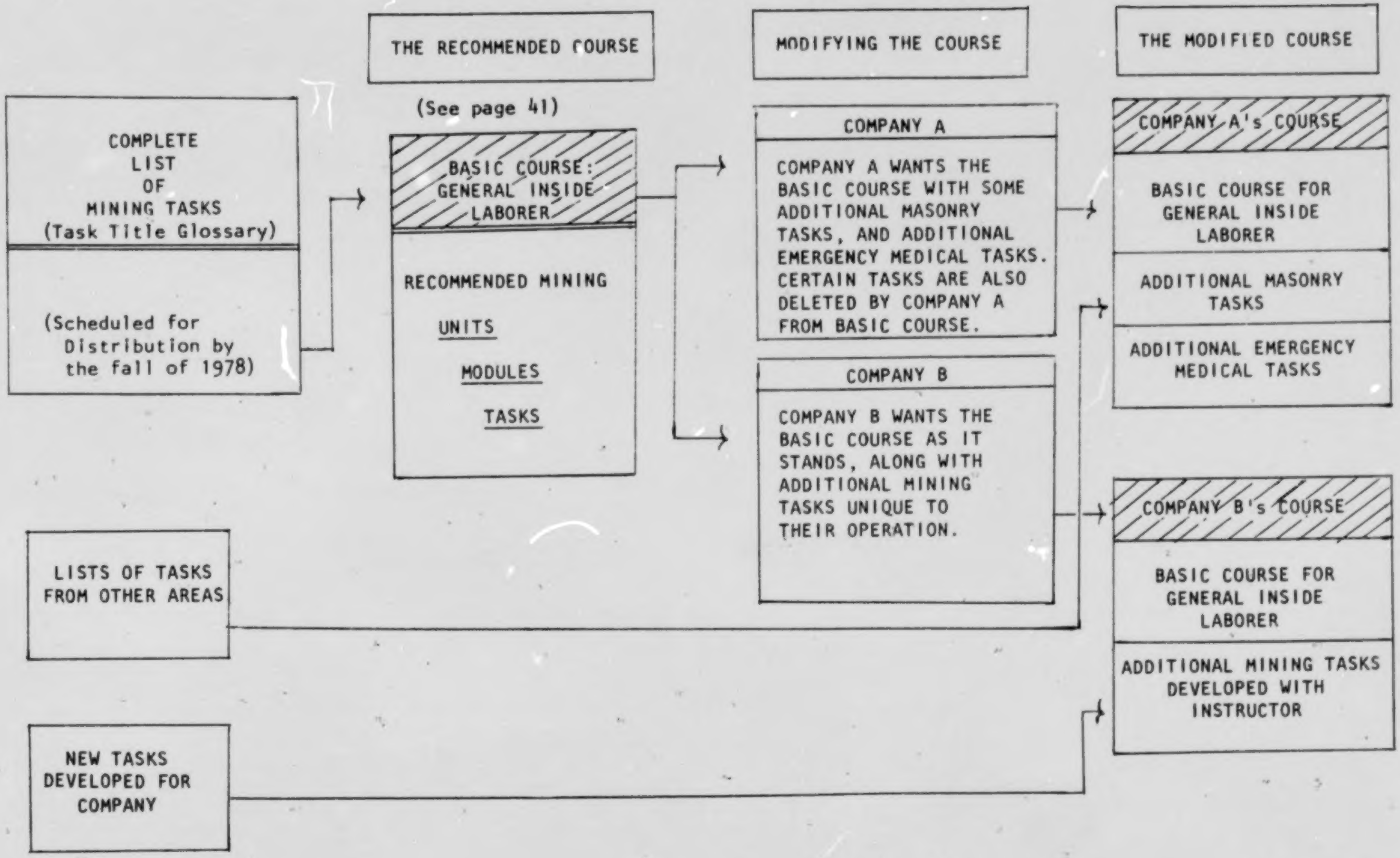
GENERAL INSIDE LABORER COURSE

SELECTED TASKS FROM AUTO MECHANICS TASK GLOSSARY.

COMPLETE LIST OF AUTO MECHANICS TASKS

EXAMPLE III

MODIFYING TO A COMPANY'S NEEDS
(COMPANY SPONSORED ADULT EDUCATION)

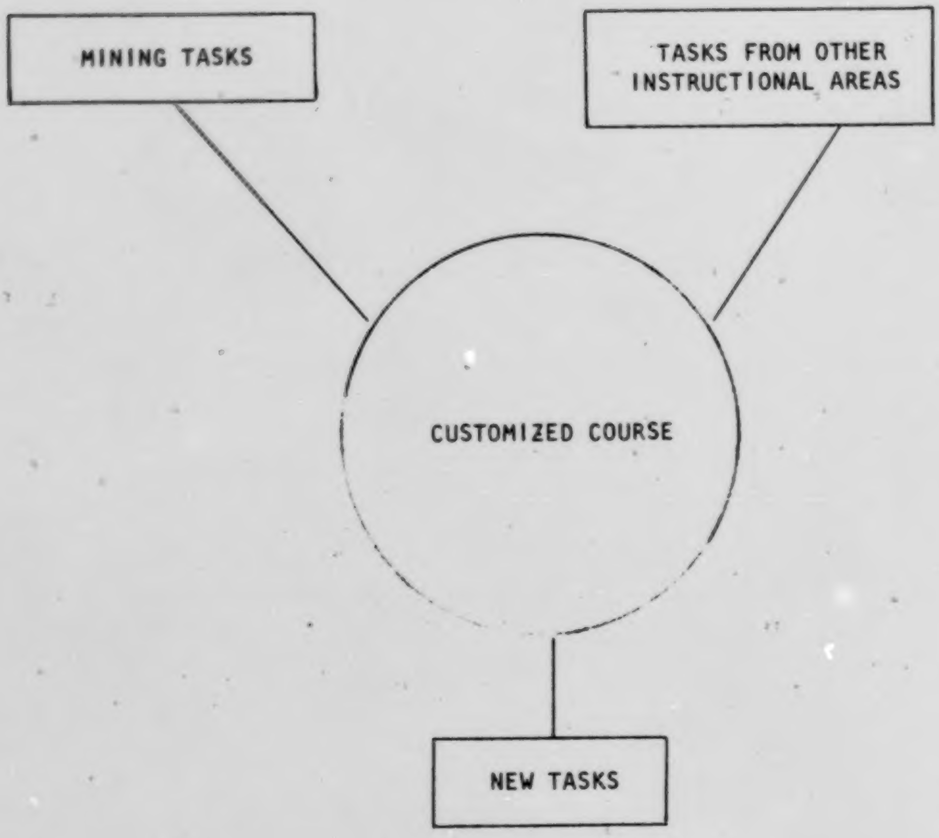

THE RECOMMENDED COURSE
MODIFYING THE COURSE
THE MODIFIED COURSE
COMPLETE LIST OF MINING TASKS (Task Title Glossary)
(See page 41)
BASIC COURSE: GENERAL INSIDE LABORER
RECOMMENDED MINING
UNITS
MODULES
TASKS
COMPANY A
COMPANY B
COMPANY A's COURSE
BASIC COURSE FOR GENERAL INSIDE LABORER
ADDITIONAL MASONRY TASKS
ADDITIONAL EMERGENCY MEDICAL TASKS
COMPANY B's COURSE
BASIC COURSE FOR GENERAL INSIDE LABORER
ADDITIONAL MINING TASKS DEVELOPED WITH INSTRUCTOR
LISTS OF TASKS FROM OTHER AREAS
NEW TASKS DEVELOPED FOR COMPANY

(Scheduled for Distribution by the fall of 1978)

COMPANY A WANTS THE BASIC COURSE WITH SOME ADDITIONAL MASONRY TASKS, AND ADDITIONAL EMERGENCY MEDICAL TASKS. CERTAIN TASKS ARE ALSO DELETED BY COMPANY A FROM BASIC COURSE.

COMPANY B WANTS THE BASIC COURSE AS IT STANDS, ALONG WITH ADDITIONAL MINING TASKS UNIQUE TO THEIR OPERATION.

USING THE TWO OPTIONS
-- OPTION II --
CUSTOMIZING A COURSE OF STUDY


MINING TASKS
TASKS FROM OTHER INSTRUCTIONAL AREAS
CUSTOMIZED COURSE
NEW TASKS

Using the Two Options
-- Option II --
Customizing a Course of Study

Sometimes the Instructor will find that the recommended courses, even when modified, do not adequately meet the particular training and educational needs of a particular company or student population. At this point, the recommended course should be abandoned and the Instructor should develop a completely new course.

The complete Task Glossary for Mining, together with the closely related Task Glossaries in areas such as Electricity, Welding, Masonry, etc., provide the Instructor with a large listing of tasks from which he or she can develop a course designed to meet almost any particular training need.

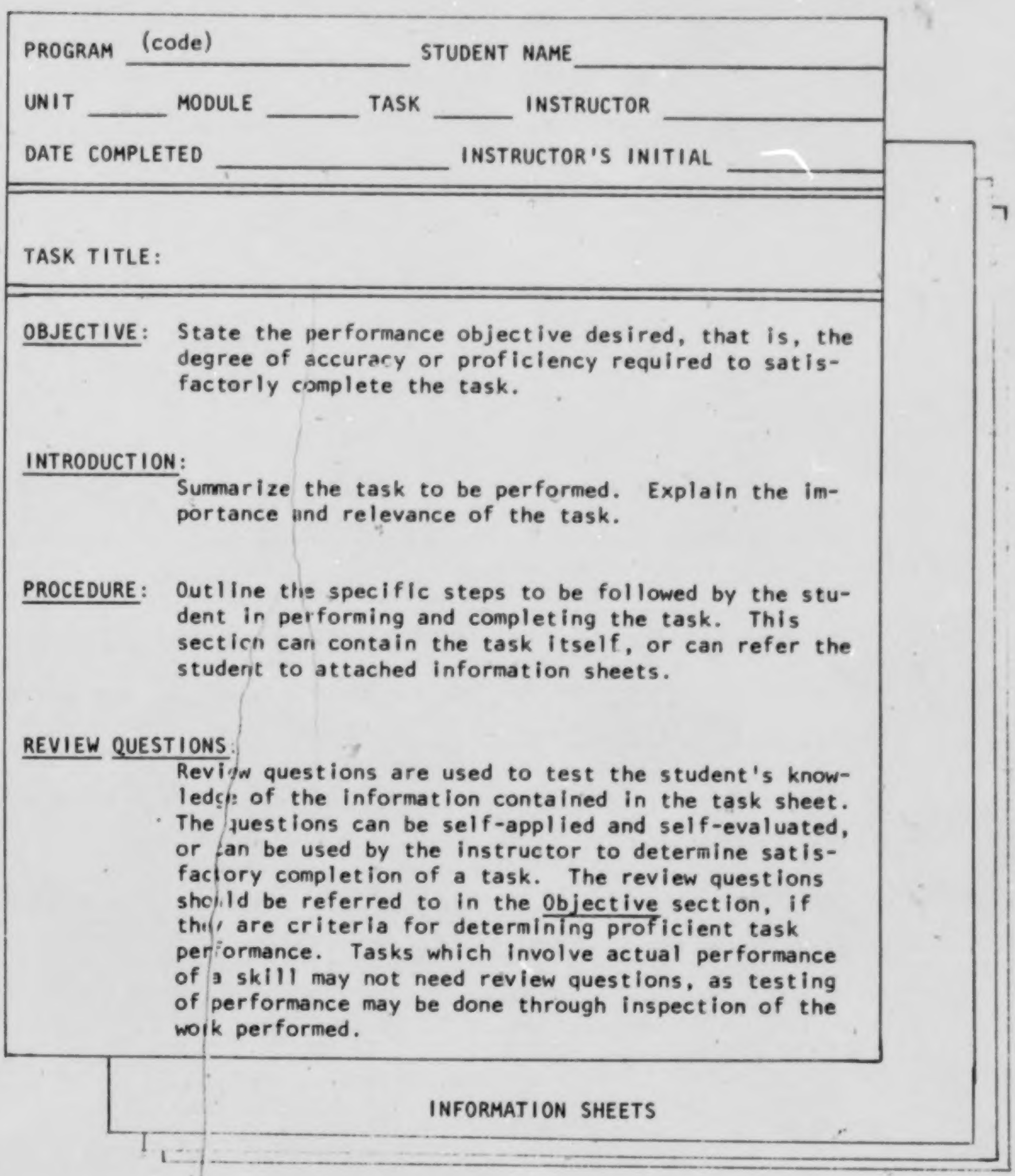
The Instructor may find that new tasks will need to be identified and developed into task sheets. By using a format for task sheets similar to the one found in this manual, the Instructor can develop new task sheets for just about any training need. Task sheets which provide for learning of academic skills such as basic reading, writing, mathematics can be developed utilizing this format. Specific company policy, new occupational developments, various skills needed for uncommon machinery; these can all be translated into task sheets and included in a student's course of study.

Three sources, then, can be used by the Instructor to develop new courses of study for specific or unusual training needs:

1. The Mining Task Glossaries found in the Admiral Peary Vo-Tech Mining series.
2. The Task Glossaries from other related instructional areas available from competency based curricula development programs at the Admiral Peary Vo-Tech and various colleges and universities.
3. New task sheets developed by the Instructor.

TASK SHEET FORMAT

NOTE: Task sheets are designed to be provided to each student, used by the student in performing the task, and then placed into the student's notebook/reference manual.



PROGRAM (code) ____________ STUDENT NAME ____________

UNIT ______ MODULE _______ TASK ______ INSTRUCTOR ____________

DATE COMPLETED ____________ INSTRUCTOR'S INITIAL ______

TASK TITLE:

OBJECTIVE: State the performance objective desired, that is, the degree of accuracy or proficiency required to satisfactorly complete the task.

INTRODUCTION: Summarize the task to be performed. Explain the importance and relevance of the task.

PROCEDURE: Outline the specific steps to be followed by the student in performing and completing the task. This section can contain the task itself, or can refer the student to attached information sheets.

REVIEW QUESTIONS: Review questions are used to test the student's knowledge of the information contained in the task sheet. The questions can be self-applied and self-evaluated, or can be used by the instructor to determine satisfactory completion of a task. The review questions should be referred to in the Objective section, if they are criteria for determining proficient task performance. Tasks which involve actual performance of a skill may not need review questions, as testing of performance may be done through inspection of the work performed.

INFORMATION SHEETS

MAINTAINING RECORDS
AND
CREATING STUDENT TEXTBOOKS

Maintaining Records of Student Progress

There are a number of ways in which the Instructor can keep track of the tasks completed by each student. The Instructor should devise a method which would work best in each particular teaching situation.

Whichever method is used, the Instructor should be able to show prospective employers or parents exactly which tasks have been completed by the student at any point in time.

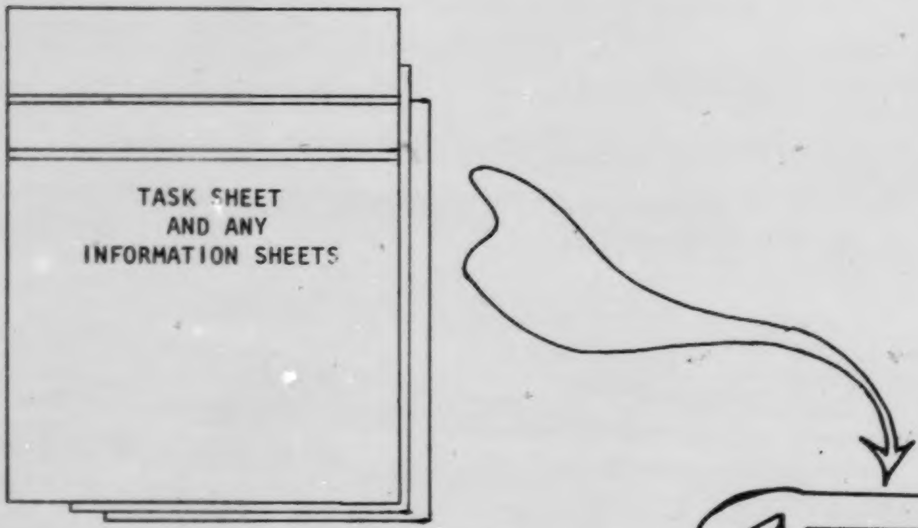
The student will have a personal record of tasks completed in the notebook which he or she creates from the task and information sheets. The Instructor's records of completed tasks should always match with the completion dates recorded on the student's task sheets.

One method of keeping records of completed tasks which has worked well in actual usage appears on the following page.

D2 = PROGRAM - AREA CODE (See page)
01.01.010 = 01 (UNIT) .01 (MODULE) .010 (TASK)

STUDENT	COURSE TITLE	TASKS IN COURSE OF STUDY/COMPLETION DATES									
JACOBS, ARNOLD	1. ENTRY LEVEL ORIENTATION 2. FACEMAN	D2 01.01.010	01.01.020	01.01.020	01.01.030	01.02.010	01.02.010	01.02.030	01.03.010	02.01.010	
		9/15	9/18	10/28	10/29			9/25	10/1		
TAYLOR, PAT	1. ENTRY LEVEL ORIENTATION 2. GENERAL INSIDE LABORER 3. PRECISION MASON	D2 01.01.010	01.01.020	01.01.030	02.01.010	02.01.020	02.01.030	C3 05.03.010	05.03.020	05.03.030	
		9/20	9/23					10/2	10/5		
(Adult Evening) MITCHELL, JAMES	1. SPECIAL ORIENTATION COURSE FOR AJAX MINING CORP.	D2 01.01.030	01.01.040	01.04.010	01.04.020	01.04.030	07.01.010	07.01.020	07.01.030	07.02.010	
		10/1	10/5	10/7	10/9						

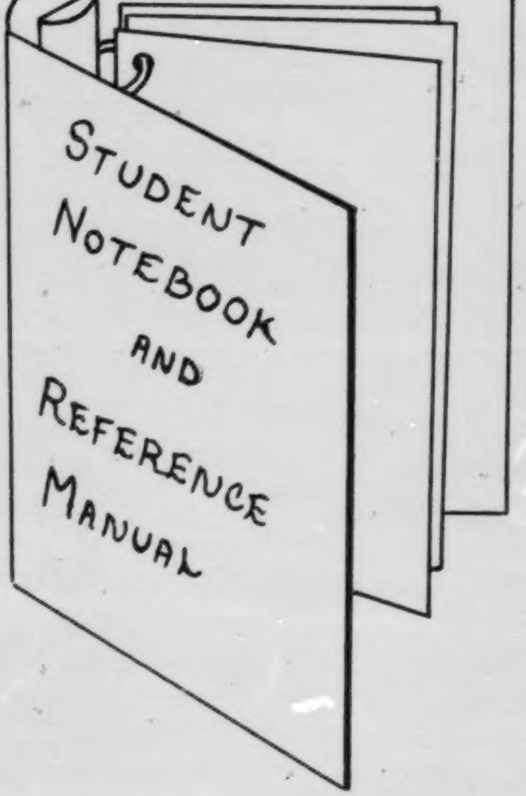
CREATING STUDENT TEXTBOOKS FROM THE TASK SHEETS


TASK SHEET
AND ANY
INFORMATION SHEETS

TASK SHEETS SHOULD BE HANDED TO THE STUDENT AND PUT INTO A NOTEBOOK WHICH BECOMES THE STUDENT'S PERSONAL TEXT AND REFERENCE MANUAL.

TASK SHEETS CAN BE HANDED OUT EITHER:

1. AS THE TASKS ARE PERFORMED, OR ALL AT ONCE. THAT IS,
2. ALL THE TASKS SELECTED FOR THE COURSE OF STUDY CAN BE HANDED OUT AT THE BEGINNING OF THE COURSE AND CHECKED OFF AS THEY ARE COMPLETED.


STUDENT
NOTEBOOK
AND
REFERENCE
MANUAL

TASK TITLE GLOSSARY
FOR
COURSE I-III

LISTING OF INSTRUCTIONAL PROGRAM AREAS

PROGRAM CODE	PROGRAM TITLE
A.	
1.	Agriculture Technology
2.	Horticulture & Floriculture
B.	
1.	Automotive Body Repair
2.	Automotive Mechanical Repair
C.	
1.	Carpentry
2.	Electricity
3.	Masonry
4.	Plumbing and Pipefitting
D.	
1.	Machining
2.	Mining
3.	Welding
E.	
1.	Cosmetology
2.	Health Services
3.	Introduction to Distributive Education
4.	Advanced Distributive Education
5.	Quantity Food Services
6.	Audiovisual Communications
7.	Building and Grounds Maintenance
8.	Warehousing
F.	
1.	Electronics Technology
2.	Engineering - Related Technology
3.	Mechanical Drafting & Design Technology
4.	Scientific Data Processing

ADMIRAL PEARY AREA VOCATIONAL-TECHNICAL SCHOOL
EBENSBURG, PA. 15931

TASK TITLE GLOSSARY MINING D-2

REQUIRED TASKS FOR THE PROGRAM OF STUDY

AREA	PROGRAM	UNIT	MODULE	TASK	TASK TITLES
D	2				
		01			Entry Level Orientation
			01		General Information
				010	The Geology and Formation of Coal
				020	Method of Mining
			02		Miner's Contract
				010	Grievance Procedure
				020	Job Bidding
			03		Company Policy and Orgainzation
				010	Organizational Structure of the Mine
				020	General Work Procedures
				030	Available Jobs Underground
			04		Deep Mine Operation
				010	Mining System: Conventional Mining (Cutting and Loading)
				020	Mining System: Continuous Mining
				030	Scoop and Battery Tractors
				040	Mining System: Longwall Mining

ISSUE ________ DATE ____________ P 1 OF 7

REVIEWED & APPROVED: RESEARCH _____ INSTRUCTOR _____ ADMINISTRATION _____

AREA	PROGRAM	UNIT	MODULE	TASK	TASK TITLES
D	2				
		01			ENTRY LEVEL ORIENTATION
			04		DEEP MINE OPERATION
				050	PILLAR RECOVERY
				060	COMMON MINING TOOLS AND THEIR USES
				070	COMMON MINING TERMS
				080	THE PROPERLY DRESSED MINE WORKER
				090	LUBRICANTS AND LUBRICATING EQUIPMENT
				100	PERMISSIBLE EXPLOSIVES AND BLASTING DEVICES
				110	TRANSPORTATION AND STORAGE OF PERMISSIBLE EXPLOSIVES AND DETONATORS
		02			SAFETY
			01		GENERAL SAFETY
				010	PROPER MANUAL LIFTING PROCEDURES
				020	SAFE PRACTICES ALONG TRACK AND BELT HAULAGEWAYS
				030	SAFE PRACTICES ALONG THE TRAM ROAD
				040	SAFE PRACTICES AT THE FACE
				050	CLASSIFICATION OF MINE FIRES
				060	CAUSES, PREVENTION AND HAZARDS OF MINE FIRES
				070	RESPIRABLE DUST
				080	ROCK DUST
			02		SAFETY AROUND MACHINERY
				010	PROPER METHOD OF RIDING IN A MANTRIP.

P 2 OF 7

AREA	PROGRAM	UNIT	MODULE	TASK	TASK TITLES
D	2				
		02			Safety
			02		Safety Around Machinery
				020	Proper Procedures for Crossing Over and Riding Belts
				030	Energize and De-Energize Track Equipment
			03		Safety Around Electricity
				010	Safe Practices when Dealing with Electricity
				020	Safe Practices when Dealing with Electricial Cables and Lines
			04		Gases and Gas Detection
				010	Mine Gases
				020	Mine Damps
				030	The History and Principle of Operation of the Flame Safety Lamp
				040	Disassembly, Assembly and Maintenance of the Flame Safety Lamp
				050	Permissible Hand-Held Methane Detector
		03			Mine Emergencies
			01		Federal and State Regulations
				010	Federal Regulations-First Aid Equipment, Location and Procedures
			02		Emergency Procedures and Equipment
				010	Types and Operation of Portable Fire Extinguishers
				020	Audio-Visual Fire Alarm System

AREA	PROGRAM	UNIT	MODULE	TASK	TASK TITLES
D	2	03			Mine Emergencies
			02		Emergency Procedures and Equipment
				030	Deluge Fire Control System
				040	Self-Rescue Respirators
				050	Emergency Procedures when Trapped or Pinned
			03		Basic First Aid Procedures
				010	Basic First Aid Procedures
			04		First Aid For Life
				010	First Aid Treatment for Impaired Breathing
				020	First Aid Treatment for Circulatory Failure
				030	First Aid Treatment for Severe Bleeding
				040	Bandaging and Dressing Wounds
				050	First Aid Treatment for Shock
			05		Specific Injuries First Aid
				010	First Aid Treatment for Burns
				020	General First Aid Care for Open Wounds
				030	First Aid Treatment for Chest and Stomach Wounds
				040	First Aid Treatment for Eye Injuries
				050	First Aid Treatment for Broken Bones and dislocations
				060	First Aid Treatment for Rib Fractures
				070	First Aid Treatment for Spinal Injuries

P 4 OF 7

AREA	PROGRAM	UNIT	MODULE	TASK	TASK TITLES
D	2	03			Mine Emergencies
			05		Specific Injuries First Aid
				080	First Aid Treatment for Skull Fractures and Concussions
				090	First Aid Treatment for Sprains and Strains
				100	First Aid Treatment for Stroke
				110	First Aid Treatment for Heart Attack
				120	First Aid Treatment for Diabetic Emergencies
				130	First Aid Treatment for Epileptic Emergencies
				140	First Aid Treatment for Heat Exhaustion
				150	First Aid Treatment for Heat Cramps
				160	First Aid Treatment for Heat Stroke
				170	First Aid Treatment for Exposure
				180	First Aid Treatment for Frostbite
				190	First Aid Treatment for Ingested and Inhaled Poisons
				200	First Aid Treatment for Poisonous Snake Bites
				210	First Aid Treatment for Insect Bites and Stings
			06		Transportation of Accident Victims
				010	How to Transport an Accident Victim
		04			Roof Rib Control
			01		Introduction to Roof Rib Control
				010	Entry Roof Support

P 5 OF 7

AREA	PROGRAM	UNIT	MODULE	TASK	TASK TITLES
D	2	04			Roof Rib Control
			01		Introduction to Roof Rib Control
				020	Testing Roof, Face and Ribs
				030	Testing Face for Trapped Water
			02		Roof Supports
				010	How to Set Props For Roof Support
				020	How to Set Crossbars For Roof Support
				030	How to Build Cribbing for Roof Support
				040	Roof Bolting
				050	Temporary Roof Support
				060	How to Operate Chocks (Hydraulic Powered Self Advancing Roof Supports
				070	Speciality Roof Control
			03		Roof Support Plans
				010	Roof Support Plans
				020	Timbering Plan for a Pillar Section
		05			Communications
			01		Communication Systems
				010	Visual Mine Communication
				020	Verbal Mine Communication
				030	Operation and Location of Pager System
				040	Audio and Olfactory Mine Communications

P 6 OF 7

AREA	PROGRAM	UNIT	MODULE	TASK	TASK TITLES
D	2	06			Ventilation and Air Control
			01		Bratticing
				040	Building a Regulator
				050	Mine Doors
			02		Basic Information on Ventilation
				010	How and Why a Mine is Ventilated
				020	Identify Symbols on a Ventilation Map
				030	Draw a Mine Ventilation Map with Symbols
				040	Hanging Line and Check Curtains
				050	Face Ventilation
			03		Equipment
				010	Anemometer
				020	Use of the Anemometer

RECOMMENDED COURSE OF STUDY

COURSE I

ENTRY LEVEL ORIENTATION

This course contains tasks recomended for the new miner, the person entering the deep mine for the first time.

The course emphasizes safety awareness, safe working procedures and attitudes, and basic first aid. All of the orientation requirements of the Mining Enforcement and Safety Administration (MESA) are included in this recommended course.

Additional tasks can be added, or tasks can be deleted, to meet the specific needs of the students or their sponsor.

ADMIRAL PEARY AREA VOCATIONAL-TECHNICAL SCHOOL
EBENSBURG, PA. 15931

DOT TITLE: ENTRY LEVEL ORIENTATION DOT NO: N/A

SUGGESTED TASKS FOR THE PROGRAM OF STUDY

AREA	PROGRAM	UNIT	MODULE	TASK
D	2	01	01	010
				020
			02	010
				020
			03	010
				020
				030
			04	010
				020
				030
				040
				050
				060
				070

AREA	PROGRAM	UNIT	MODULE	TASK
D	2	01	04	080
				090
				100
				110
		02	01	010
				020
				030
				040
				050
				060
				070
				080
			02	010
				020
				030

AREA	PROGRAM	UNIT	MODULE	TASK
D	2	02	03	010
				020
			04	010
				020
		03	01	010
			02	010
				040
				050
			03	010
			04	010
				020
				030
				040
				050

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REVIEWED & APPROVED: RESEARCH ____ INSTRUCTOR ____ ADMINISTRATION ____

ADMIRAL PEARY AREA VOCATIONAL-TECHNICAL SCHOOL
EBENSBURG, PA. 15931

DOT TITLE: ENTRY LEVEL ORIENTATION DOT NO: N/A

SUGGESTED TASKS FOR THE PROGRAM OF STUDY

AREA	PROGRAM	UNIT	MODULE	TASK
D	2	03	05	010
				020
				030
				040
				050
				060
				070
				080
				090
				100
				110
				120
				130
				140
				150
				160

AREA	PROGRAM	UNIT	MODULE	TASK
D	2	03	05	170
				180
				190
				200
				210
			06	010
		04	01	010
				020
			02	010
				020
				030
			03	010
		05	01	010

AREA	PROGRAM	UNIT	MODULE	TASK
D	2	05	01	020
				030
				040
		06	02	010
				020

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COURSE II

GENERAL INSIDE LABORER
(D.O.T. #850.887-038)*

This course contains tasks recommended for competency in the positions of General Inside Laborer or Timber Framer. These positions generally involve persons during their first year or two in the mine. A miner usually rises through these positions to the level of Face Worker, or can branch off into more specialized occupations in fields such as masonry (bratticing), electricity, mechanics, or machine operation.

This course is similar to Course I, except that it includes more tasks relating to the actual work skills usually required in the occupational position.

Additional tasks can be added, or tasks can be deleted, to meet the specific needs of the students or their sponsor.

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* Taken from the U.S. Dept. of Labor's Dictionary Of Occupational Titles

ADMIRAL PEARY AREA VOCATIONAL-TECHNICAL SCHOOL
EBENSBURG, PA. 15931

DOT TITLE: GENERAL INSIDE LABORER TIMBERFRAMER DOT NO: 850.887-038

SUGGESTED TASKS FOR THE PROGRAM OF STUDY

AREA	PROGRAM	UNIT	MODULE	TASK
D	2	01	01	010
				020
			02	010
				020
			03	010
				020
				030
			04	010
				020
				030
				040
				050
				060
				070
				080

AREA	PROGRAM	UNIT	MODULE	TASK
D	2	01	04	090
				100
				110
		02	01	010
				020
				030
				040
				050
				060
				070
				080
			02	010
				020
				030

AREA	PROGRAM	UNIT	MODULE	TASK
D	2	02	03	010
				020
			04	010
				020
		03	01	010
			02	010
				020
				030
				040
				050
			03	010
			04	010
				020

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ADMIRAL PEARY AREA VOCATIONAL-TECHNICAL SCHOOL
EBENSBURG, PA. 15931

DOT TITLE: GENERAL INSIDE LABORER TIMBERFRAMER DOT NO: 850.887-038

SUGGESTED TASKS FOR THE PROGRAM OF STUDY

AREA	PROGRAM	UNIT	MODULE	TASK
D	2	03	04	030
				040
				050
		03	05	010
				020
				030
				040
				050
				060
				070
				080
				090
				100
				110
				120

AREA	PROGRAM	UNIT	MODULE	TASK
D	2	03	05	130
				140
				150
				160
				170
				180
				190
				200
				210
			06	010
		04	01	010
				020
			02	010
				020

AREA	PROGRAM	UNIT	MODULE	TASK
D	2	04	02	030
				040
				050
			03	010
		05	01	010
				020
				030
				040
		06	01	040
				050
			02	010
				020
				040

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COURSE III

FACE WORKER
(D.O.T. #850.781-010)*

This course contains recommended tasks for competency in the position of Face Worker. This position generally involves experienced miners working at the mine face.

This course is similar to Course I, Entry Level Orientation, and Course II, General Inside Laborer, in that it contains the basic safety tasks and work skills required of the mine laborer. The course also contains tasks on the more specialized competencies required of the person working at the mine face.

Additional tasks can be added, or tasks can be deleted, to meet the specific needs of the students or their sponsor.

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*Taken from the U.S. Dept. of Labor's Dictionary Of Occupational Titles

ADMIRAL PEARY AREA VOCATIONAL-TECHNICAL SCHOOL
EBENSBURG, PA. 15931

DOT TITLE: FACE WORKER

DOT NO: 850.781-010

SUGGESTED TASKS FOR THE PROGRAM OF STUDY

AREA	PROGRAM	UNIT	MODULE	TASK
D	2	01	01	010
				020
			02	010
				020
			03	010
				020
				030
			04	010
				020
				030
				040
				050
				060
				070

AREA	PROGRAM	UNIT	MODULE	TASK
D	2	01	04	080
				090
				100
				110
		02	01	010
				020
				030
				040
				050
				060
				070
				080
			02	010
				020
				030

AREA	PROGRAM	UNIT	MODULE	TASK
D	2	02	03	010
				020
			04	010
				020
				030
				040
				050
		03	01	010
			02	010
				020
				030
				040
				050
		03	03	010

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ADMIRAL PEARY AREA VOCATIONAL-TECHNICAL SCHOOL
EBENSBURG, PA. 15931

DOT TITLE: FACE WORKER DOT NO:850.781-010

SUGGESTED TASKS FOR THE PROGRAM OF STUDY

AREA	PROGRAM	UNIT	MODULE	TASK
D	2	03	04	010
				020
				030
				040
				050
			05	010
				020
				030
				040
				050
				060
				070
				080
				090
				100

AREA	PROGRAM	UNIT	MODULE	TASK
D	2	03	05	110
				120
				130
				140
				150
				160
				170
				180
				190
				200
				210
			06	010
		04	01	010
				020
				030

AREA	PROGRAM	UNIT	MODULE	TASK
D	2	04	02	010
				020
				030
				040
				050
				060
				070
			03	010
				020
		05	01	010
				020
				030
				040
		06	02	010

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ADMIRAL PEARY AREA VOCATIONAL-TECHNICAL SCHOOL
EBENSBURG, PA. 15931

DOT TITLE: FACE WORKER DOT NO: 850.781-010

SUGGESTED TASKS FOR THE PROGRAM OF STUDY

AREA	PROGRAM	UNIT	MODULE	TASK
D	2	06	02	020
				030
				040
				050
			03	010
				020

AREA	PROGRAM	UNIT	MODULE	TASK

AREA	PROGRAM	UNIT	MODULE	TASK

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USE OF MATERIALS
IN
VARIOUS PROGRAM TYPES

There are several reasons for the development of the "competency based individualized curricula system." The organizing of course content by units, modules, and individual tasks makes it relatively easy for an instructor to customize a course for each individual need. The system also permits the student to proceed at his or her own rate, whereby the student's strengths and weaknesses can be determined by the rate and proficiency with which each task is accomplished.

There is an additional benefit of the curricula methods presented in this manual. The instructor provides himself or herself with the capability of quickly designing a course for any type of educational program. The task sheets in this manual are only part of the complete list of mining tasks, called the Task Glossary for Mining.* The masonry tasks were taken from the Task Glossary for Masonry.

The benefits of using the competency based individualized curricula system in the shop or classroom are similar regardless of the type of program. Students learn individual tasks at rates determined by their own strengths and weaknesses. Instructors, administrators, parents, and employers have available meaningful records of these strengths and weaknesses; as well as meaningful records of the tasks in which the student has achieved proficiency. The customized course content also reflects the interests and goals of each individual student.

Below are some of the types of programs with which instructors can be of great assistance in designing and implementing through use of their own (and other instructors') Task Glossary and teaching methods:

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*The Task Glossary for Mining is expected to be ready for distribution by December, 1978.

1. Special Programs:

The Task Glossary, task sheets, and self-paced individualized teaching methods have all proved extremely helpful in designing and implementing programs for the special student (the physically and mentally handicapped, the emotionally disturbed, the culturally disadvantaged, and the student with other learning disabilities). In a manner similar to the techniques illustrated in Examples I, II, and III, a course of study can be individualized to the special needs of each student.

For instance, a Mining program can include basic mining skills supplemented by units, modules, and individual tasks from non-mining areas which recognize the weaknesses or disabilities of each student. By including task groupings targeted to the particular weaknesses or strengths of each special student, and to the particular interests of each student, these students can achieve their full potential as with any student.

Mainstreaming becomes extremely feasible by utilizing the curricula methods described in this manual. Special students can be put into the secondary program with a course of study customized to their particular needs, just as their "normal" classmates have their own customized courses of study.

Essentially, the curricula methods described in this manual provides the tools by which the instructor can treat every student as "special", with special needs, special interests, and unique strengths and weaknesses.

2. Pre-Secondary Programs:

Programs for grades K-9 can be readily designed and implemented for both "career awareness" and "career exploration" programs. Students can be given actual tasks to perform in order to gain "hands on" exposure to the skills involved in each occupational field. Many of the introductory tasks contained in the Task Glossaries can be used directly or revised for use with pre-secondary children. Performance of the tasks involve the children more directly in exploring the nature of each occupational field.

Units and modules can be arranged, as with secondary programs, to establish both awareness and exploration programs of any length, or for any age group, or for any interest level.

TASK SHEETS

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
STUDENT NAME
UNIT 01 MODULE 01 TASK 010
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *The Geology and Formation of Coal.*

Objective:

After studying the material, the student will describe the formation of different grades of coal to the satisfaction of the instructor by answering the review questions to 100% accuracy.

Procedure:

1. Study the information sheet.
2. Review the illustrations.
3. Answer the Review Questions.
4. Direct any questions about the material to the instructor.

Review Questions:

1. What is peat?
2. Name three forces that act on a layer of peat to form coal.
3. What is the most available type of coal?
4. What is an outcrop?
5. What information is included in "mining rights"?
6. Name three types of coal.
7. What makes the layer of material directly above a bed of coal?

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DATE 5/23/77
P 1 OF 3

REVIEWED & APPROVED
RESEARCH MJK
INSTRUCTOR
ADMINISTRATION

PREPARED BY: Mr. L. Thomas Gailey

PROGRAM D-2 UNIT NO. 01 MODULE NO. 01 TASK NO. 010

INFORMATION SHEET

Millions of years ago the earth was covered with water. As land was pushed out of the water by earthquakes and other natural forces, large swamps were formed. These swamps became filled with large plants and trees. Much of the United States was covered by these huge swamps.

As the plants died, they fell, rotted and formed a layer of strata within these swamps. Under normal conditions, this peat would simply become topsoil in a few hundred years. However, the conditions were not normal. Violent earthquakes were constantly changing the contour and shape of the earth. These large swamps were often covered by parts of the oceans, streams or lakes. As the water rushed into these swamps, it brought dirt and rock and laid these materials on top of the peat. Sea plants and fish also died and fell to the bottom. As these earthquakes continued, layer on layer of dirt, rocks, sand and dead organisms were piled on this seam of peat.

When the land was finally pushed from under the sea, hundreds of feet of strata lay over this seam of peat. This strata caused extreme heat and pressure to act on the seam of peat. The bacteria in this seam (or bed) caused the peat to change. This change formed a substance called lignite. Lignite is a low grade of brown coal. As the heat and pressure continued over thousands of years, the lignite was pressed into a layer of bituminous coal. The layers of dirt and rock were pressed into layers of shale and sandstone. The remains of sea life became limestone beds.

If the beds of peat were considerably deeper than most, the coal formed is a type of hard coal called anthracite coal. However, anthracite is very rare in comparision with lignite or bituminous coal.

Anthracite is used chiefly as a household heating fuel. It burns with much less smoke than the other forms of coals. Bituminous coal is not only the most available form, but also the most useful in industry. This form burns easily and is used as a raw material in the production of many chemicals, oils and gases. Bituminous coal is also used in the production of some foods, textiles, cement products and paper.

There are vast reserves of coal in the United States (See map). However, the Appalachian foothills near the east coast offer the highest grades of bituminous coal that can be mined easily. For this reason, these coal beds are responsible for the highest coal production in the country.

Coal beds in this area are approximately 700 ft. underground and range in height from 2 to 7 feet.

These beds are often split or cut by erosion. (Erosion: the process of wearing away the strata by the movement of wind, water or glaciers.) The resulting beds (See fig. #2) are called "outcrops". These outcrops are still considered to be section of the same bed.

Before any mining may begin, the company must purchase the mining right from the owner to a particular area. Like any property purchase, these rights have a designated boundary. This boundary is called a property line and mining cannot proceed beyond these lines. These rights also strictly indicate the type of material that may be mined. (Coal, limestone, etc.)

PROGRAM D-2 UNIT NO. 01 MODULE NO. 01 TASK NO. 010

FIG. 1 COAL RESERVES IN THE U.S.

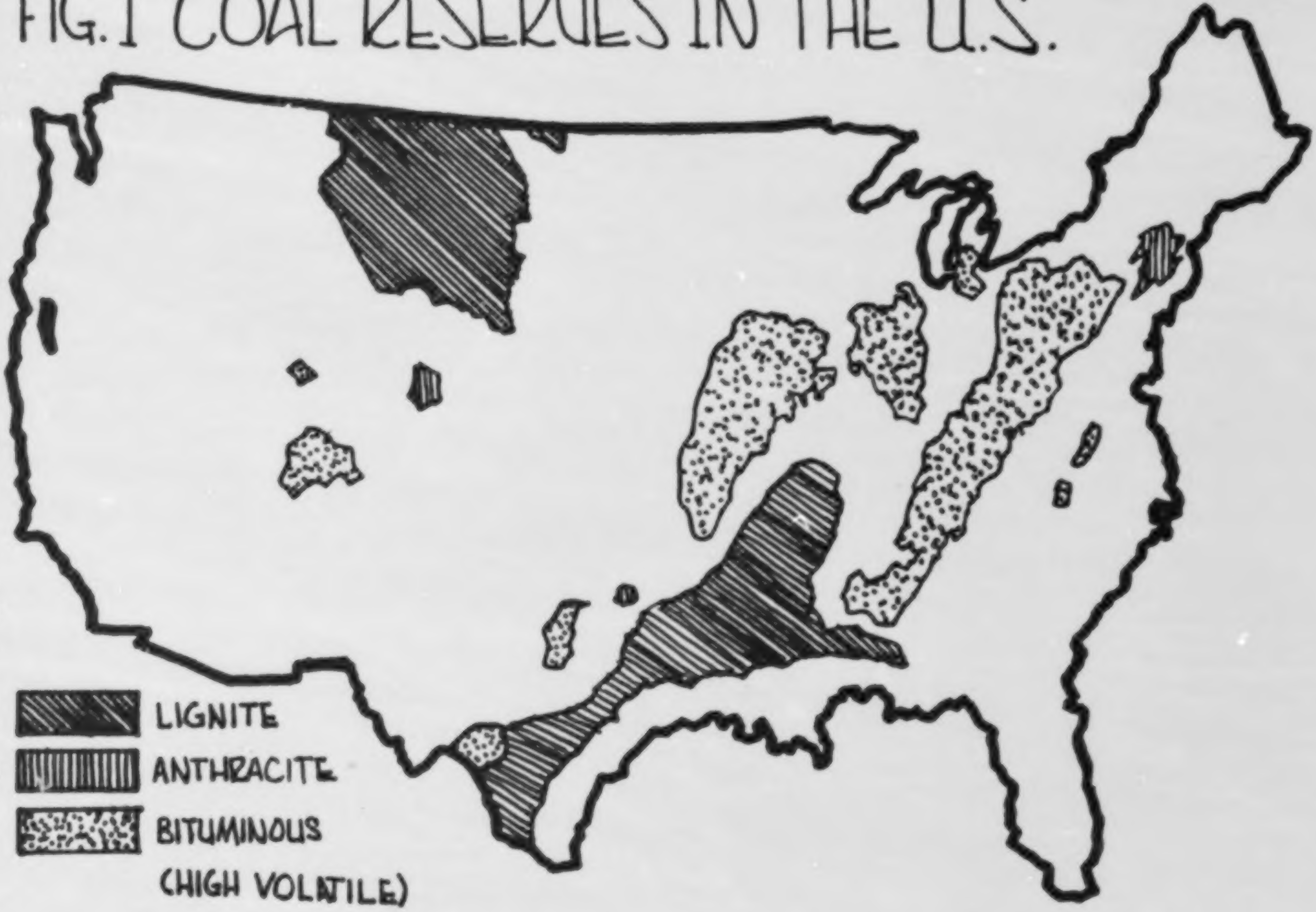
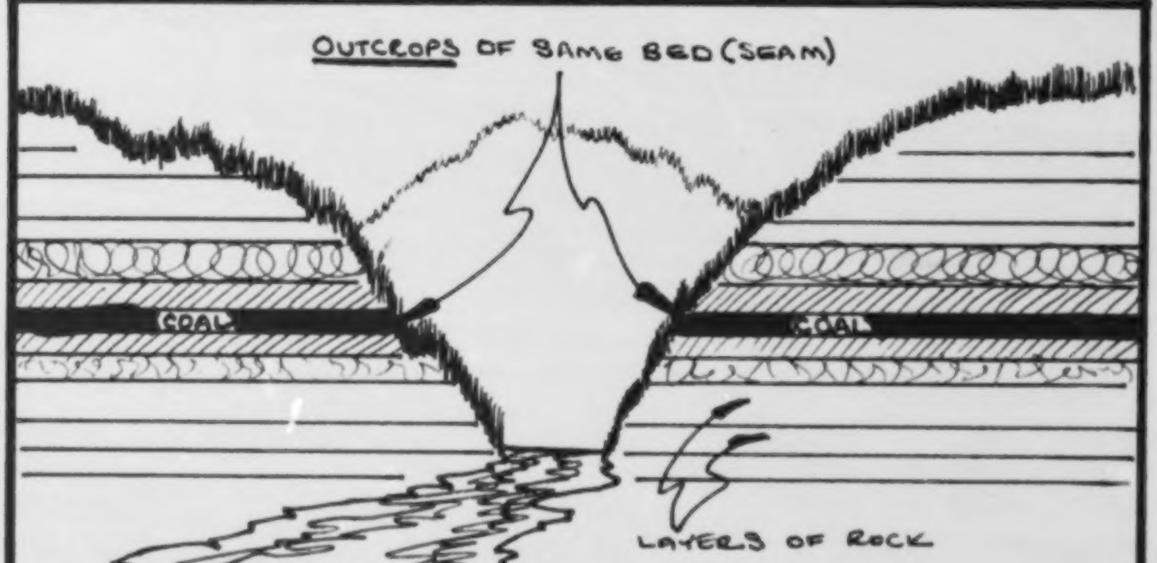

▨ LIGNITE
▥ ANTHRACITE
▒ BITUMINOUS (HIGH VOLATILE)

FIG. 2 EXAMPLE OF OUTCROPS


OUTCROPS OF SAME BED (SEAM)
COAL
COAL
LAYERS OF ROCK

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2 STUDENT NAME

UNIT 01 MODULE 01 TASK 020 INSTRUCTOR

DATE COMPLETED INSTRUCTOR'S INITIALS

TASK TITLE: *Methods of Mining.*

Objective:

After studying the material, the student will describe the types of mining currently in use and the methods used to reach coal seams to the satisfaction of the instructor. The student will also answer the review questions to 80% accuracy.

Procedure:

1. Reread the objective.
2. Study the information sheet.
3. Answer the review questions.

Review Questions:

1. What are the two basic methods of mining?
2. Name two uses of shafts.
3. What is the basic difference between slope and drift mines?
4. What are the two common methods of transporting coal from slope or drift mines?
5. Name three common systems of mining coal.

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REVIEWED & APPROVED RESEARCH M&K INSTRUCTOR AG ADMINISTRATION

PREPARED BY: Mr. L. Thomas Gailey

INFORMATION SHEET

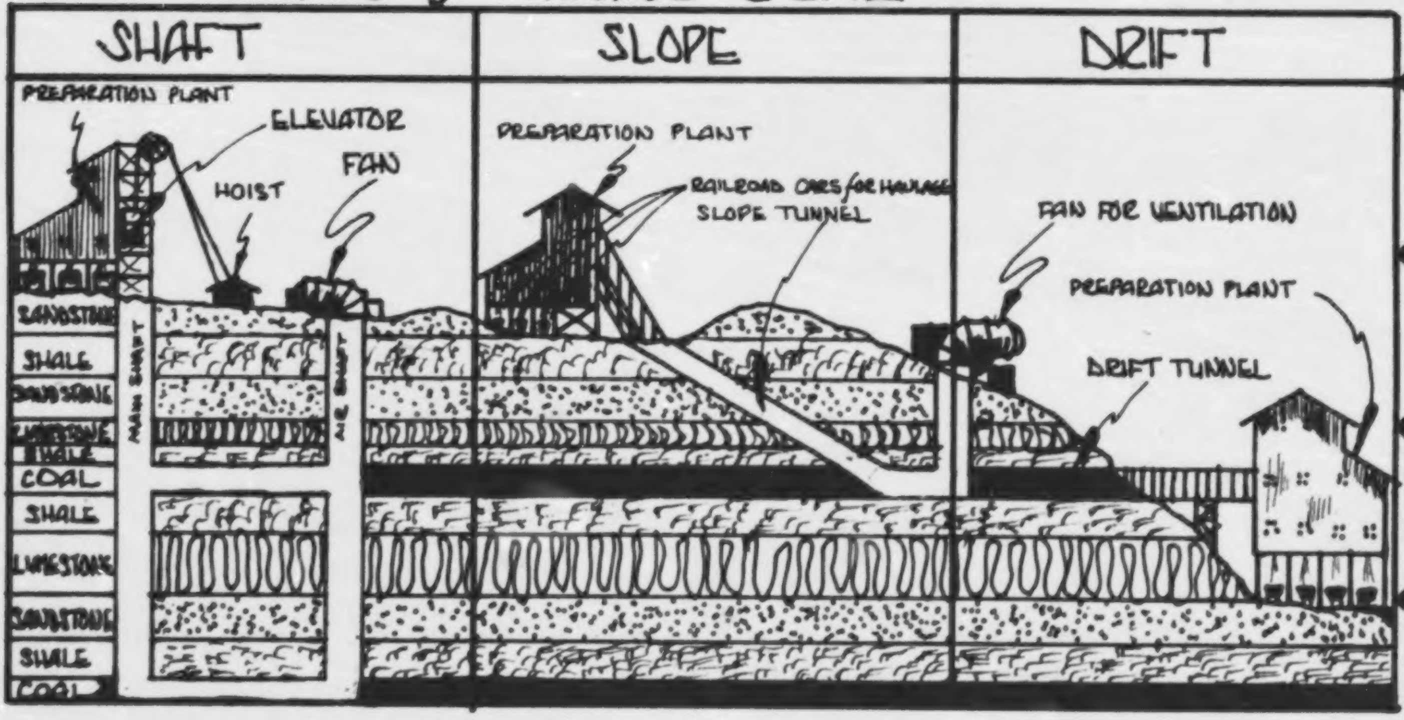
There are two basic methods of removing the coal from underground seams: surface and underground mines.

Surface mining (also called "strip" mining), produces less than half of the total amount of coal mined in the United States. In this method, the layers of strata above the coal seam are removed by large shovels and other forms of heavy equipment and piled in a nearby location. The coal seam is then broken up and removed by the same equipment. Obviously, this method can only be used when the coal seam is near the surface and the company has large amounts of land to mine.

If these conditions are not possible, underground (deep) mining is the best method of removing coal. One of the most difficult tasks in deep mining is to find a method of moving men and machines to the coal seam and transporting the coal to the outside by the same method.

There are three common methods of getting to the seam: slopes, drifts and shafts. (See Illustration)

WAYS of MINING COAL


SHAFT
SLOPE
DRIFT
PREPARATION PLANT
ELEVATOR
HOIST
FAN
SANDSTONE
SHALE
SANDSTONE
LIMESTONE
SHALE
COAL
SHALE
LIMESTONE
SANDSTONE
SHALE
COAL
MAIN SHAFT
AIR SHAFT
PREPARATION PLANT
RAILROAD CARS FOR HAULAGE
SLOPE TUNNEL
FAN FOR VENTILATION
PREPARATION PLANT
DRIFT TUNNEL

A shaft is simply a hole dug straight down until the seam (or seams, as shown in the illustration) is reached. Equipment, men and coal are transported on large elevators. This method of entry is used when the coal seam is very deep.

PROGRAM D-2 UNIT NO. 01 MODULE NO. 01 TASK NO. 020

A "slope" is an entry dug through the upper layers of strata into the coal seam. The slope may be dug at different angles depending on the conditions of the strata.

Often, the strata is sliced by some force (a river, earthquake, etc.) and the seam of coal is exposed. (Like the strata exposed by a highway cut through the mountains.) In this case, it is easiest to simply start the entry directly into the coal seam. This entry is called a "drift".

In larger mines, shafts are often dug as well as slopes or drifts to transport men quickly to and from working sections or to help ventilate the mine.

Once the coal seam has been reached, a particular mining system is used to remove the coal. There are three mining systems used most often: conventional mining (cutting and loading), continuous mining or longwall mining. The details of each system are long and are discussed in other task sheets.

Once the coal has been broken from the seam, it must be transported out of the mine. As mentioned earlier, the coal from shaft mines is loaded into cars and lifted from the mine in an elevator. In slope or drift mines, the coal is removed by track mounted cars or by a system of conveyor belts which extend from a section near the face to the outside.

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2 STUDENT NAME

UNIT 01 MODULE 02 TASK 010 INSTRUCTOR

DATE COMPLETED INSTRUCTOR'S INITIALS

TASK TITLE: *Grievance Procedure.*

Objective:

After studying the information sheet, the student will briefly list the grievance steps followed by completing the chart.

Procedure:

1. Read the objective several times.
2. Study the information sheet.
3. Answer all review questions.

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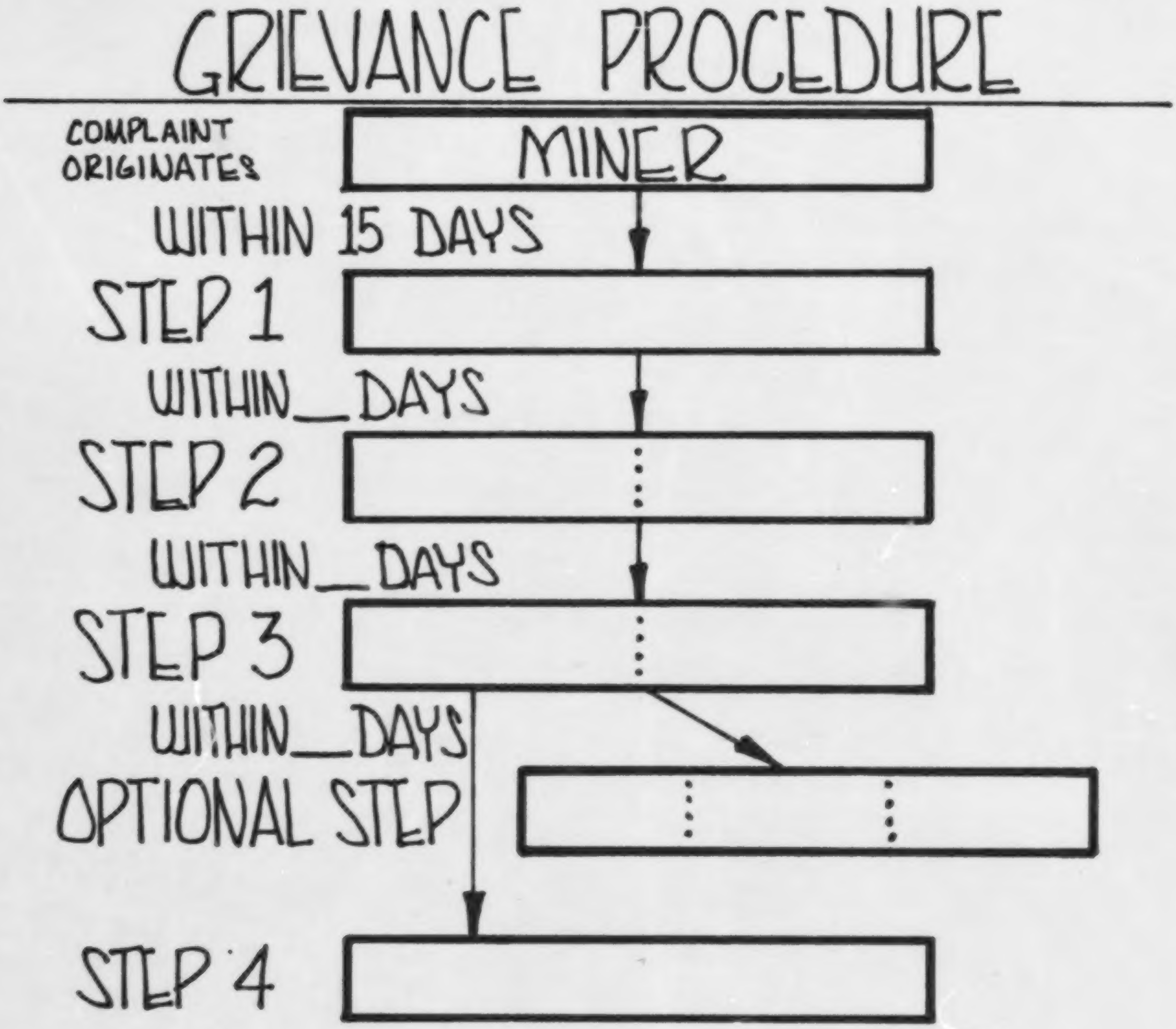
REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. Louis Christoff

PROGRAM D-2 UNIT NO. 01 MODULE NO. 02 TASK NO. 010

Review Questions:

1. Complete the following chart.


GRIEVANCE PROCEDURE
COMPLAINT ORIGINATES
MINER
WITHIN 15 DAYS
STEP 1
WITHIN_DAYS
STEP 2
WITHIN_DAYS
STEP 3
WITHIN_DAYS
OPTIONAL STEP
STEP 4

PROGRAM D-2 UNIT NO. 01 MODULE NO. 02 TASK NO. 010

INFORMATION SHEET

If differences arise between any miner and the employer, or company, such differences should try to be solved at the earliest practicable time. The following procedure should be used:

1. The miner should notify his foreman of his complaint. His foreman has 24 hours to decide how to settle the matter.
2. If no agreement is reached, the complaint is taken to the mine committee and mine management within 7 working days. (The mine committee consists of at least 3 appointed Union members.) They fill out a form stating the complaint, their positions and decisions.
3. If no agreement is reached within 7 working days, the complaint is taken to a Union representative of the UMWA district and a representative of the employer. If they reach a decision, a testimony must be recorded. If the representatives fail to agree, they must prepare a concise joint statement of their views and positions and sign it.
4. The complaint is then taken to the arbitration panel within 10 calandar days. One member of the panel decides the case without delay (no later than 15 days). If necessary, a hearing is held to hear testimony and receive evidence. The arbitrator's decision is considered final, unless petitioned.
5. Either party may petition the Arbitration Review Board to appeal the decision of the panel member, if the decision conflicts with a similar case's decision, involves a question of contract interpretation, or is dishonest or subject to change.

   If the Board decides the grounds for appeal are valid, the parties are notified and the Board decides by majority vote how to remedy the panel members decision, signs their decision and sends a copy to each party.

An employee must be notified of a complaint within 15 calendar days or the complaint will be considered untimely and not processed further.

The complaining miner has the right to be present during the entire procedure.

Sometimes another step is added between steps 3 and 4. If the representatives can not agree, the complaint is sent to a committee made up of the Union's commissioners, a Public Relations man and a stenographer. If they can not reach a decision, the complaint is sent on to step 4, the arbitration panel.

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
STUDENT NAME
UNIT 01 MODULE 02 TASK 020
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *Job Bidding.*

Objective:

After reading the information sheet, the student will show he understands the job bidding procedure by answering the review questions to 90% accuracy.

Procedure:

1. Read the objective several times.
2. Study the information sheet.
3. Answer all review questions.

Review Questions:

1. How does a miner bid for a job?
2. Define: panel members.
3. How are panel members and excused absentees notified if job bid postings?
4. Where are the job bids posted?
5. How long are they post?
6. Who reviews the applicants and on what considerations do they base their decision?
7. Under what condition does a miner's pay rate change if he is held at his original job for a period of 30 days?
8. Briefly explain the procedure followed when a senior employee removes his name from the bidding sheet.

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REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. Louis Christoff

9. Briefly explain the procedure followed when an employee wishes to bid on another job.

10. Once a miner has bid on a job and is assigned that job, must he take the job?

INFORMATION SHEET

According to Article XVII of the National Bituminous Coal Wage Agreement of 1974, senior employees, who can step into and perform the work at that time, will be given preference in awarding bids on job postings.

Job Bidding Procedure

The job or vacancy must be posted by management in a noticeable place at all mine portals for a period of seven calendar days, but no less than five production days, and must clearly state the portal, job title, wage rate, shift and the most recent measurement of respirable dust in the work place. The date, or estimated date, when the job will be available must also be posted.

Any employee is permitted to bid on the job vacancy during the seven-day posting period. He does so by signing his name on the bid sheet.

In case of a layoff, those miners laid off (termed panel members) are notified of any job bids available and are considered on the basis of seniority and ability. A panel member can bid on a job in another mine under the same company but he will enter that mine with zero mine seniority.

After seven days, the names of those panel members and working miners are reviewed by the mine foreman, the clerk and the superintendent. Within five production days after the end of the posting period, the senior employee having the ability to perform the work will be selected from the applicants. He may be required to remain on his present job for sometime but not more than 30 days. During these 30 days, he will receive the high wage rate from his new job. If his new job pays a lower rate, he will still receive the highest rate, which would be his previous job's rate, during the 30 days.

He will receive the highest wage rate between the two job classifications.

All employees absent from work due to illness or other excusable reasons during the posting period will be notified by mail of the job vacancy.

During the posting and selection period, it may be necessary to fill the job being bid on but the experience gained by the employee filling the job will not be considered when reviewing the applicants. In a case where no fully-trained operator bids on a job bid, the senior full-trained helper on the shift will be promoted to that job.

If a senior employee withdraws his bid before the end of the posting period, notice of his withdrawal will be posted next to the job posting and the posting period will be extended another 48 production hours.

If an employee wishes to bid on a job with the same or a lower wage rate than his present rate, he must wait at least 12 months from the time he was selected for his present job. If he wishes to bid on a higher wage rate, there is no waiting period.

If an employee is informed by the U.S. Dept. of Health, Education and Welfare that he has black lung, that employee must be given a job bid in a less dusty area if he wants that job.

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2 STUDENT NAME

UNIT 01 MODULE 03 TASK 010 INSTRUCTOR

DATE COMPLETED INSTRUCTOR'S INITIALS

TASK TITLE: *Understand the Organizational Structure of the Mine.*

Objective:

After reading the information sheet, the student will briefly explain the term "company personnel" by answering the review questions correctly.

Procedure:

1. Read the objective at least twice.
2. Read and reread the information sheet.
3. Answer the review question.

Review Question:

1. Briefly explain what is meant by "company personnel".

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REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. Louis Christoff

PROGRAM D-2 UNIT NO. 01 MODULE NO. 03 TASK NO. 010

INFORMATION SHEET

Company personnel, those not belonging to the union, are as follows in order of job superiority:

A. Company Owner
B. Supervisory Personnel
    1. Superintendent
    2. Mine Foreman
    3. -Electrician Supervisor
        -Mechanics Supervisor
    4. Chief Mechanic
    5. Chief Electrician
    6. -Assistant Mine Foreman or Section Boss
        -Face Boss
        -Safety Department Personnel
        -Surveying Crew
    7. Office Personnel (Clerks)
C. Central Supply
    1. Supply Manager

The persons that hold these positions are responsible for the adminstration, operation and planning of the mine. Many of these positions, require that the individual be placed in a working section, for the purpose of supervising all work and safety. All non-company positions are discussed in another task sheet labelled All Jobs Underground.

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
STUDENT NAME
UNIT 01 MODULE 03 TASK 020
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *General Work Procedures.*

Objective:

After studying the information sheet, the student will briefly explain employment requirements, brass check system, wage rates, reporting on and off work, the proper way to walk in low areas and good housekeeping in the mine by answering all review questions to 90% accuracy.

Procedure:

1. Read the objective several times.
2. Study the information sheet.
3. Answer all review questions.

Review Questions:

1. List the two employment requirements for the mine.
2. Briefly explain the two purposes of a brass check.
3. How long must a miner work before he is permitted to be left alone in the mines?
4. How soon before a miner can begin bidding on a job?
5. What is the wage rate for overtime? Saturdays? Sundays?
6. Briefly explain the procedure used to report off from work.
7. When walking in low areas, why keep your head bent to the side?
8. How does one obtain his mining papers?

ISSUE 1
DATE 5/23/77
P 1 OF 3
REVIEWED & APPROVED
RESEARCH
INSTRUCTOR
ADMINISTRATION
PREPARED BY: Mr. L. Thomas Gailey

INFORMATION SHEET

Employment Requirements:

1. Must be at least 18 years of age.
2. Must pass a general physical examination by a mine physician.

Beginning Miners

The first day, report to the appointed area at the designated time dressed properly and fully equipped for work with a mine belt and steel-toed shoes. The mine generally provides hard hats, goggles, leg bands and self rescuers. As with any job, promptness is important, but tardiness for a shift in the mines would mean missing the mantrip. Each beginning miner is issued a form of mine identification called a brass check. A "check" as shown in Fig. #1, has the name of the mine and the miner's personal identification number on a brass disc. When picking up a pay check, a brass check must be shown as proof of proper identification. Each miner must wear a cap lamp when entering the mine. By placing the "checks" on the lamp hooks when removing the lamps, the mine personnel can keep a record of who is in the mines during that shift. In other words, the brass checks are not only used as identification cards, but as part of a "check-in" and "check-out" system.

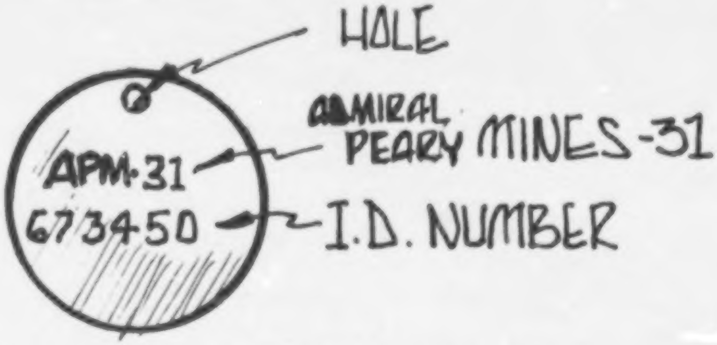

FIG. 1 BRASS CHECK

A "Ninety-day" miner is assigned to a crew and is not permitted to be left alone for at least a year or until he has passed his mine exam and received his mining papers. Every crew is supervised by a foreman who instructs the men, organizes the mantrips and generally oversees the work. Beginning miners receive the low rate salary but after 90 days, they are permitted to bid on available jobs. The company will place those miners who do not bid on jobs.

For all inside employees, a work day is 8 hours, a work week is 5 days. Overtime beyond 8 hours a day is paid time and one-half and Saturdays are paid time and one-half and Sundays are paid double time. If a miner is scheduled on a Saturday, a miner, is required to work.

In the case of illness or other excusable reasons, the miner must call and report his absence as soon as possible. The company may penalize an employee for failure to report off work by dismissing him from a regular day's work or two, or even permanently.

TIPS FOR WALKING IN LOW AREAS

In low areas, be sure to crouch , or stoop and bend the head to the side at the waist (as shown in Fig. #2) so vision is not impaired. Keep the back as straight as possible to avoid back ache. Hammers and cap pieces are often used as canes for support and balance.

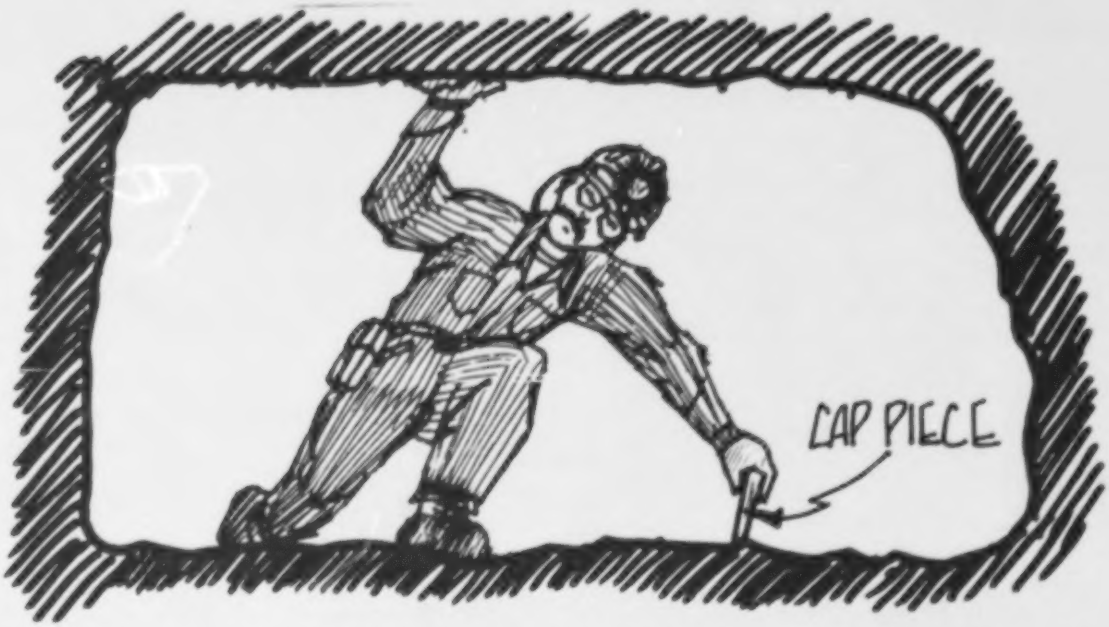

FIG.2 METHOD OF MANEUVERING IN LOW AREAS

Good Housekeeping

It is much easier to keep something clean that it is to clean something up. Good housekeeping helps make and keep safe working conditions. It is up to each employee to keep his work area and equipment clean, material properly stored, the area under foot cleared of tripping hazards and all debris removed to a disposal area. Waste material, such as lunch scraps and papers, must be placed in containers provided and not thrown on the bottom. Oil and grease spillage must be removed immediately. All tools, parts and materials must be returned to their proper location after each job. Good housekeeping forms safe working habits and develops safety awareness.

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EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
STUDENT NAME
UNIT 01 MODULE 03 TASK 030
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *Available Jobs Underground.*

Objective:

After studying the information sheet, the student will choose a job he would tentatively prefer and explain his choice.

Procedure:

1. Read the objective several times.
2. Read the Information sheet.
3. After reviewing the job list on the information sheet, choose a job which you would tentatively prefer and explain your choice.

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DATE 6/6/77
P 1 OF 2

REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. Louis Christoff

PROGRAM D-2 UNIT NO. 01 MODULE NO. 03 TASK NO. 030

INFORMATION SHEET

Concentration of Classifications of available jobs underground:

Laborer-unskilled
Wireman
Trackman
Timberman
Pumper
Mason
General Inside Labor
Bratticeman
Brakeman
Bonder
Beltman
Mechanic Helper
Electrician Helper
Electrician Trainee (Maxium 6 months)
Maintenance Trainee (Maxium 6 months)
Motorman
Shuttle Car Operator
Dumper
Faceman
Precision Mason-Construction
Shorter
Driller- Coal
Electrician Trainee (maxium 12 months)
Maintenance Trainee (maxium 12 months)
Roof Bolter Helper-Trainee
Continuous Miner Helper-Trainee
Rock Driller
General Inside Repairman and Welder
Machine Operator Helper
Loading Machine Operator
Dispatcher
Cutting Machine Operator
Roof Bolter
Welder, First Class
Longwall Machine Operator
Fireboss
Mechanic
Electrician
Continuous Mining Machine Operator

These jobs are assigned through a bidding procedure.

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PROGRAM D-2

STUDENT NAME

UNIT 01 MODULE 04 TASK 010

INSTRUCTOR

DATE COMPLETED

INSTRUCTOR'S INITIALS

TASK TITLE: *Mining Systems: Conventional Mining (Cutting and Loading).*

Objective:

After studying the information sheet and illustrations, the student will explain the basic principles of conventional mining by answering the review questions to 90% accuracy and to the satisfaction of the instructor.

Procedure:

1. Reread the objective.
2. Study the information sheet.
3. Review all illustrations.
4. Direct any questions to the instructor.
5. Answer the review questions.

Review Questions:

1. Name the five separate operations used in conventional mining in the correct order.

2. Who is permitted to set explosives?

3. How many entries are usually driven in conventional mining?

4. What are the advantages of using compressed air instead of standard explosives?

5. What is the purpose of a shuttle car?

ISSUE 1

DATE 5/11/77

P 1 OF 7

REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. L. Thomas Galley

INFORMATION SHEET

Conventional mining is the oldest of the three basic deep mining systems currently in widespread use. This system is based on three production procedures: cutting the face, blasting with explosives or compressed air and loading the coal.

The detailed description of this mining system is broken down into five separate operations.

Step #1
The face is cut to control the explosion and to prevent any material but coal to be loaded. A cutting machine will make a six inch cut along the bottom and a specific distance into the face. Since most cutting machines have a moveable blade, the ribs and roof may also be cut to assist the blasting.

As shown in Fig. #1, the cutting machine looks like a giant chain saw on wheels. The chain contains steel or carbide bits which perform the actual job of cutting. The length of the "blade" or bar is usually nine to fifteen feet. As the chain moves around the bar, it travels at a speed capable of cutting coal.

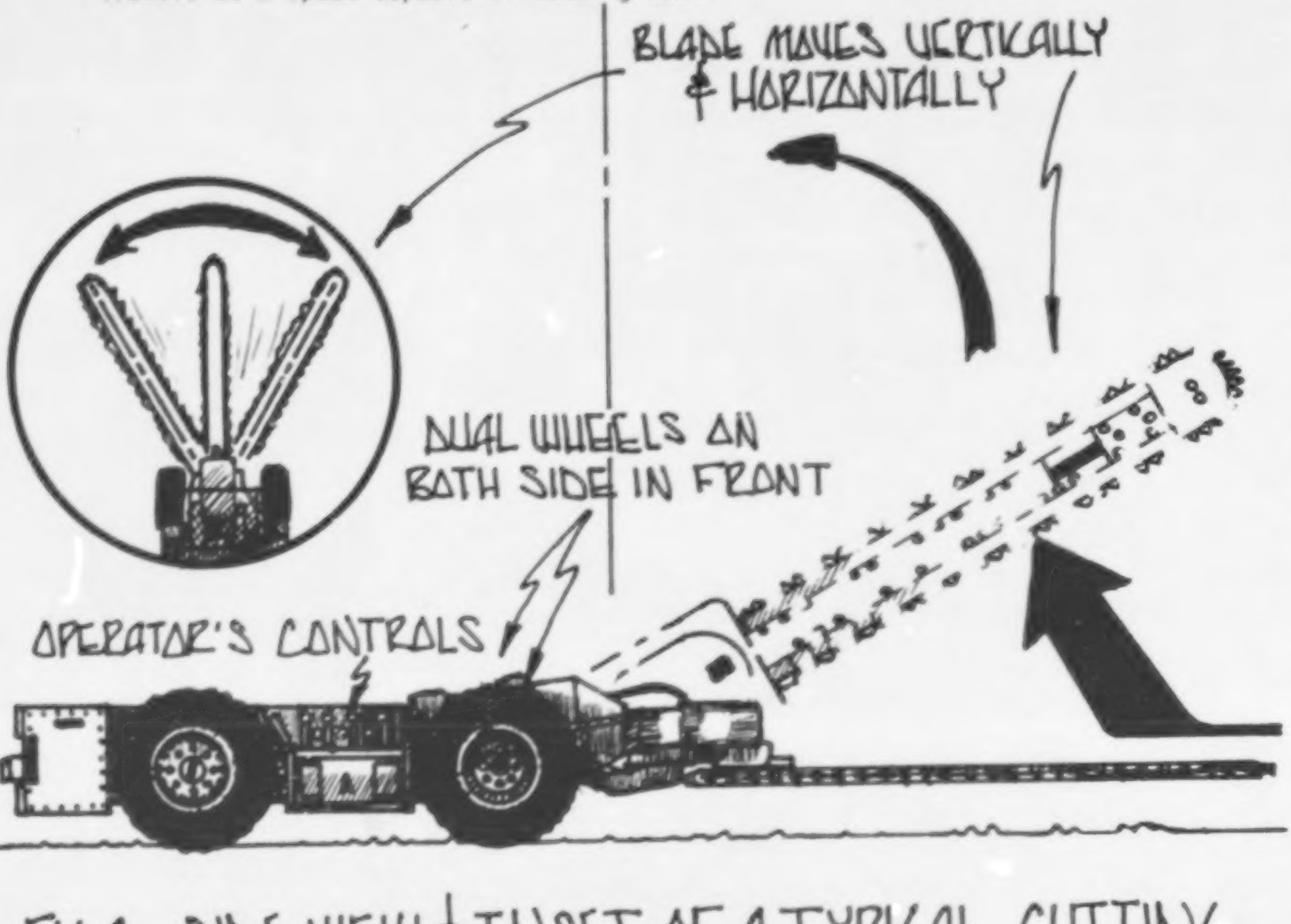

BLADE MOVES VERTICALLY & HORIZANTALLY
DUAL WHEELS ON BOTH SIDE IN FRONT
OPERATOR'S CONTROLS

FIG.1 SIDE VIEW & INSET OF A TYPICAL CUTTING MACHINE.

The process of cutting the face produces fine particles of dust which must be removed before blasting (since these may be blown throughout the entire section and become a fire hazard).

An attachment called a "bugduster" is generally found at the base of the cutter to remove the fine coal dust.

After the cutting has been completed the cutter is moved to another face to repeat the procedure there.

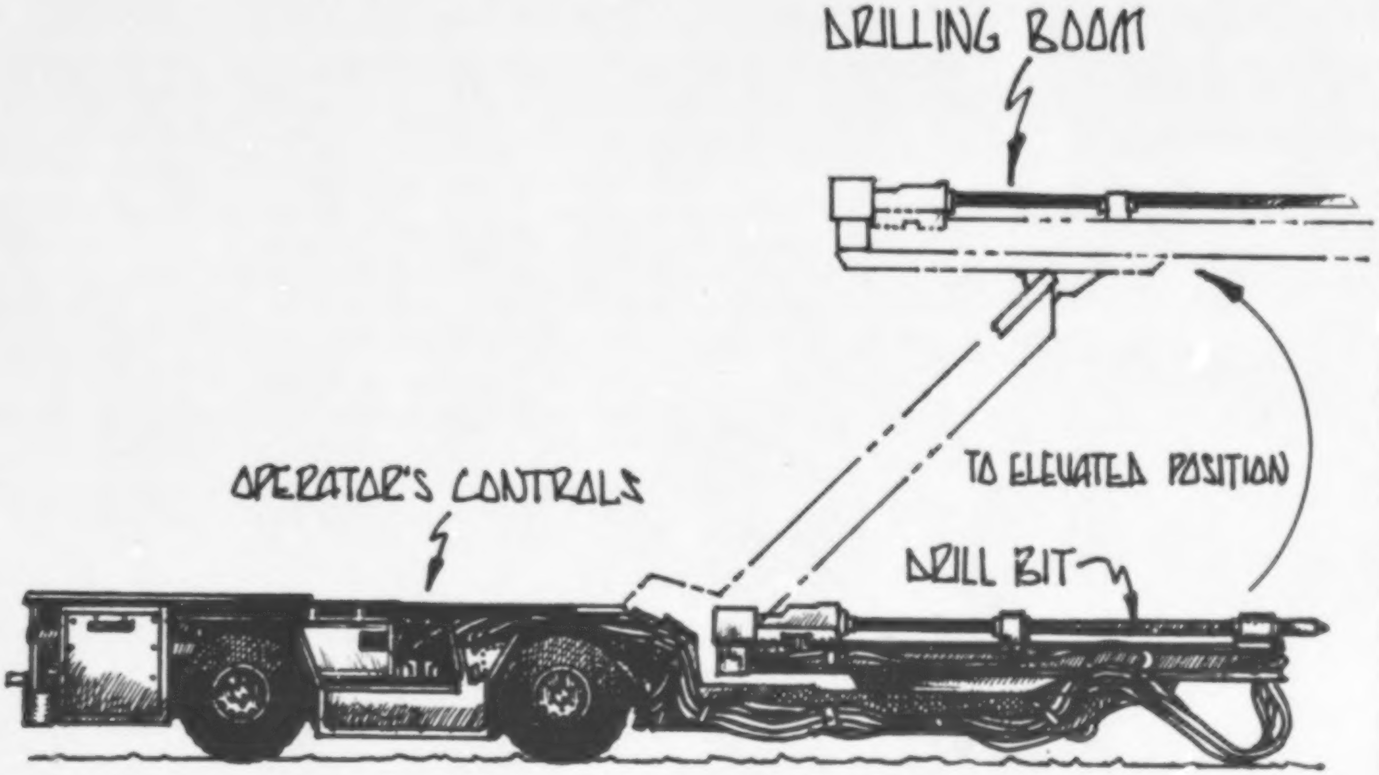


FIG2 FACE DRILL IN ELEVATED AND LOWERED POSITIONS

Step #2
A large drilling machine (Fig. #2) will drill a specific number of holes in a particular pattern into the face. The drilling machine is then also moved to another working face. (All equipment moves from one face to the next in order.)

Step #3

The explosives are set and fired. This job is given to a worker called a "shot-firer", who is licensed to perform this task. (No other worker may set or fire explosives.) Following a given procedure with a minimum of explosives, the "shot-firer" will place the explosives and detonator in the patterned holes, (Fig. #3) tamp the holes shut with a neutral filler (waterbags, clay or sand) and hook the detonator to the Firing unit. After shouting "Fire" three times to warn all nearby workers, the shot firer will detonate the explosives. (Compressed air cylinders are also used as explosives.) The explosion will break the coal into small chunks, which now must be removed.

Step #4

A loading machine is moved into this section and the shot-firer will move to the next face. A loader is a large wedge-shaped machine with mechanical arms, and a belt conveyor. (Fig. #4) As the machine is moved forward into the pile of loose coal, the wedge forces itself under the pile and mechanical arms sweep the coal onto the conveyor. The conveyor chain moves the coal to the rear of the loader where it falls onto a shuttle car (Fig. #5). The shuttle car then carries a full load of coal to a loading station or the conveyor belt. After all the coal has been loaded by this method, the loader and shuttle car move to the next section.

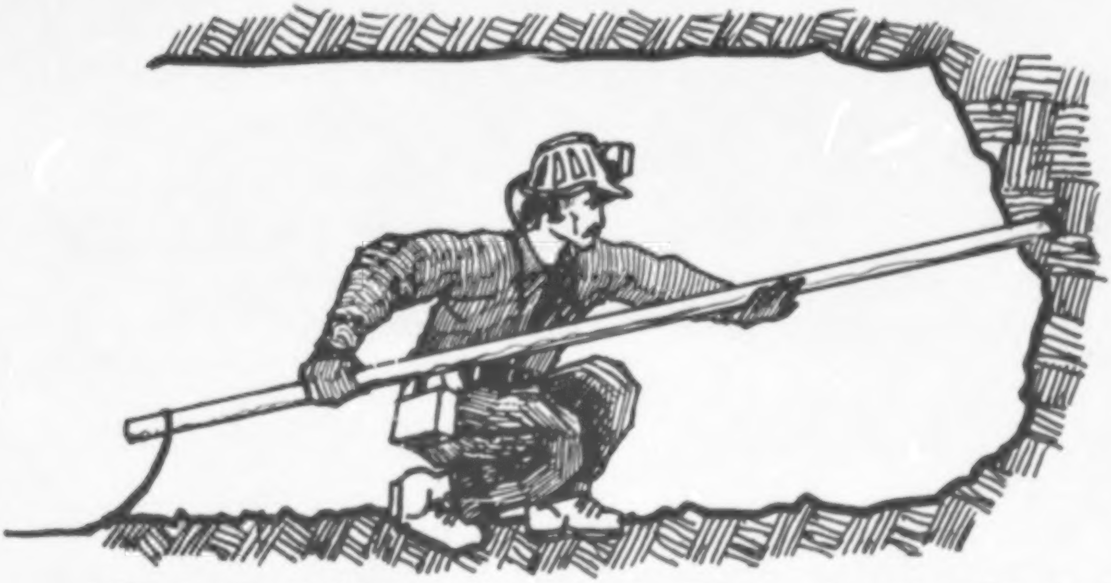
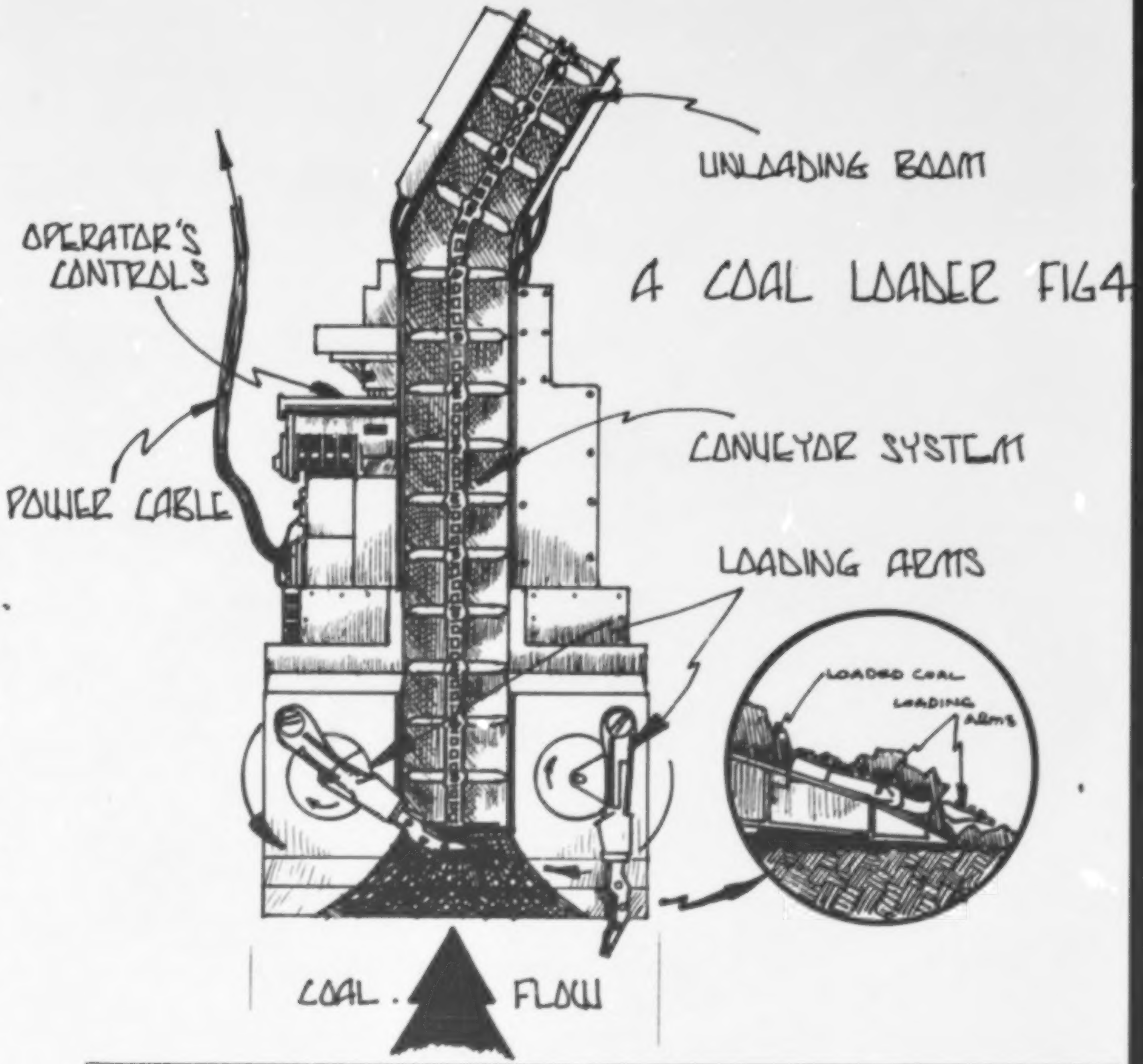


FIG.3 INSERTING AN AIR CARTRIDGE IN PREPARATION FOR FIRING.

Step #5

The final step in this operation is roof support. After the coal has been removed, the section is supported by the method established by the mines (timbering, roof bolting or both). The complete process is then started over again in this section (with a cutting machine).



A COAL LOADER FIG4.

UNLOADING BOOM
OPERATOR'S CONTROLS
CONVEYOR SYSTEM
POWER CABLE
LOADING ARMS
LOADED COAL
LOADING ARMS
COAL . FLOW

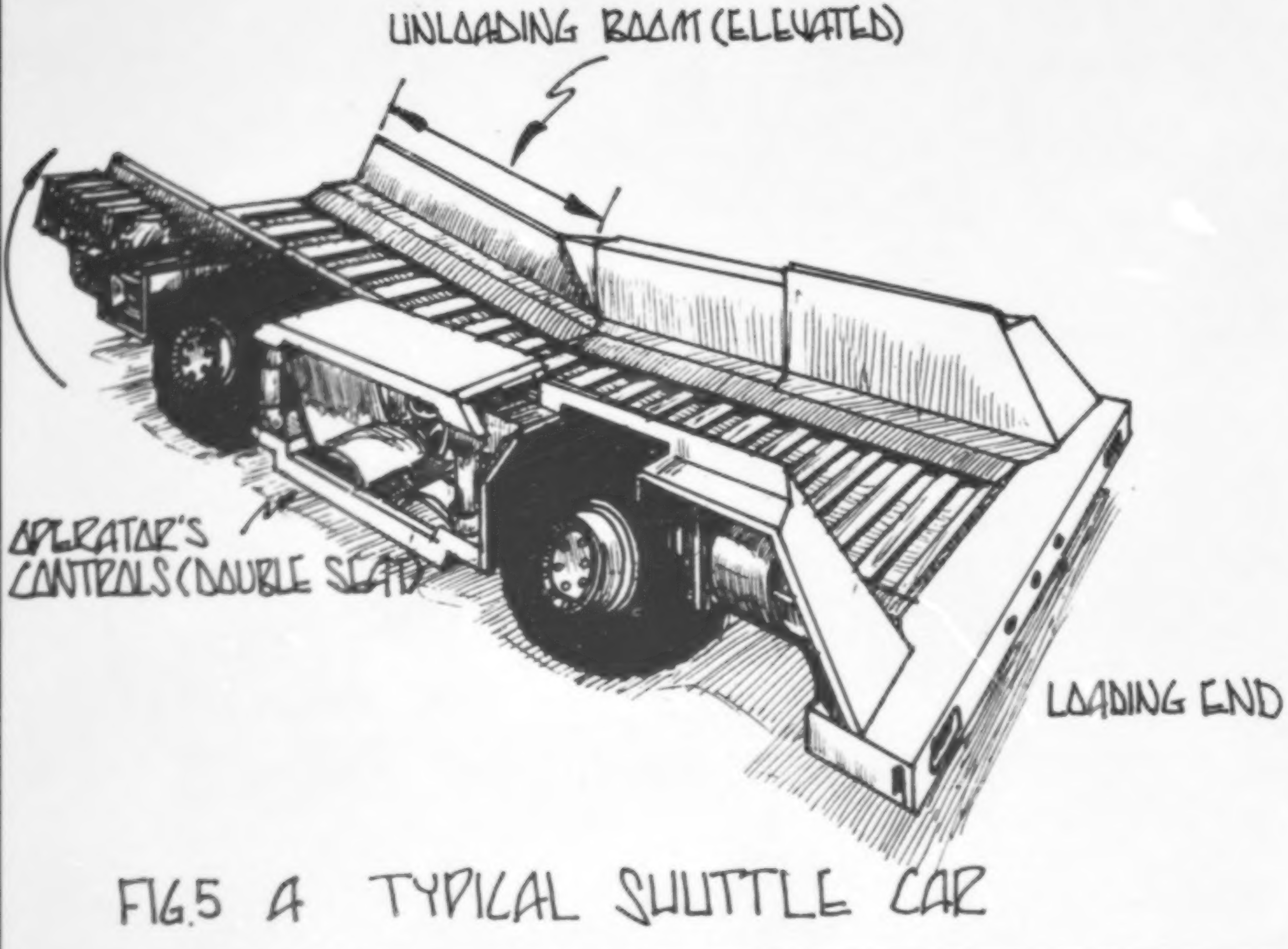
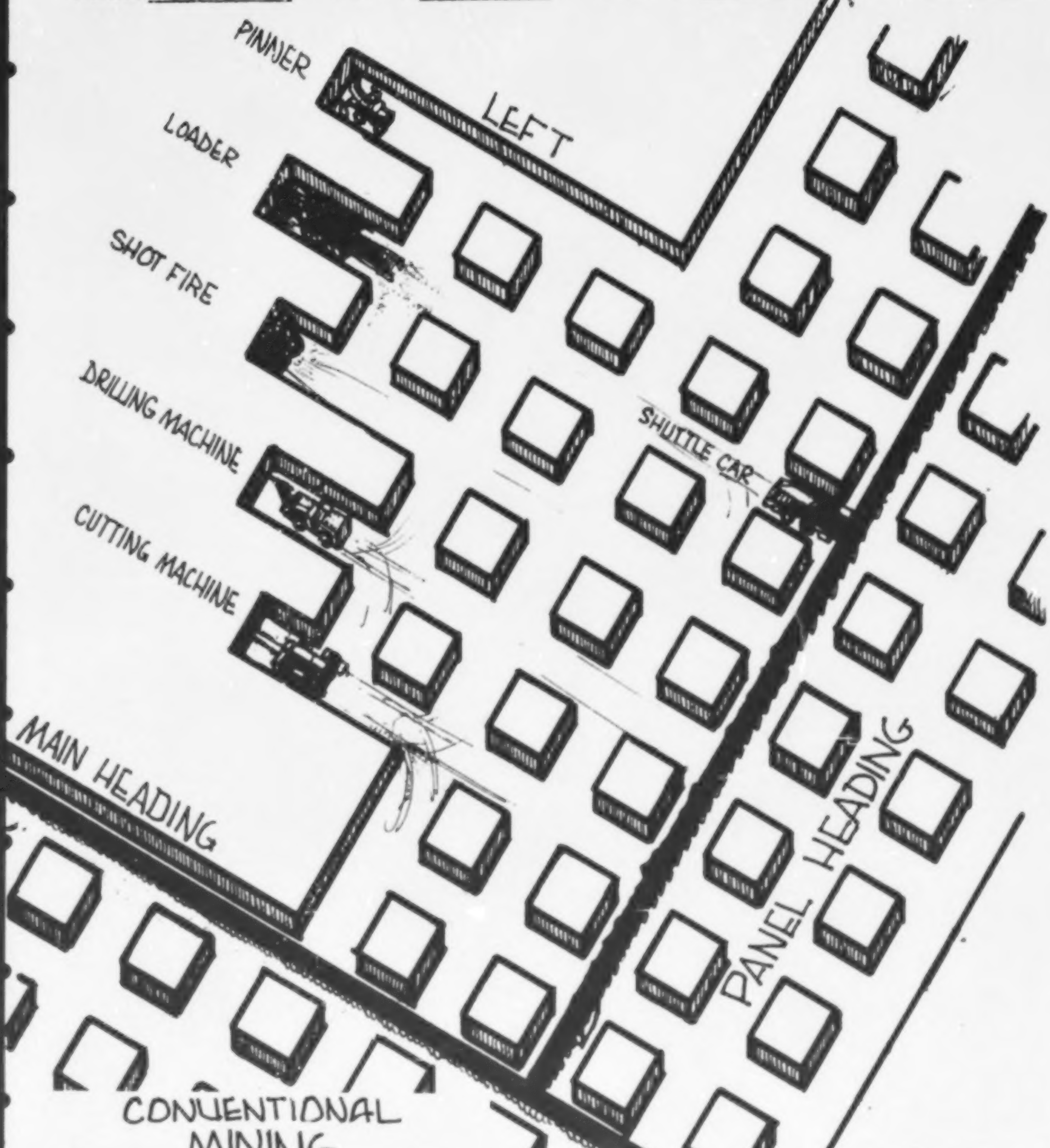

UNLOADING BOOM (ELEVATED)
OPERATOR'S CONTROLS (DOUBLE SEAT)
LOADING END

FIG.5 A TYPICAL SHUTTLE CAR

PROGRAM D-2 UNIT NO. 01 MODULE NO. 04 TASK NO. 010


PINNER
LEFT
LOADER
SHOT FIRE
DRILLING MACHINE
SHUTTLE CAR
CUTTING MACHINE
MAIN HEADING
PANEL HEADING
CONVENTIONAL MINING

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
UNIT 01 MODULE 04 TASK 020
DATE COMPLETED ____________

STUDENT NAME ____________
INSTRUCTOR ____________
INSTRUCTOR'S INITIALS ____________

TASK TITLE: *Mining Systems: Continuous mining.*

Objective:

After studying the information sheet and illustrations, the student will briefly explain the basic principles and equipment used in continuous mining by answering the review questions to 90% accuracy and to the satisfaction of the instructor.

Procedure:

1. Reread the objective.
2. Study the information sheet.
3. Review all illustrations.
4. Direct all questions, about the material, to the instructor.
5. Answer the review question.

Review Questions:

1. Name two advantages of continuous mining.

2. Name four types of continuous miners and briefly explain each.

3. What machinery is common to all continuous mines?

4. Briefly describe the two methods of transporting coal from the miner to the main haulageway.

5. What are the drawbacks of continuous mining?

ISSUE 1
DATE 5/12/77
P 1 OF 7
REVIEWED & APPROVED RESEARCH ____ INSTRUCTOR ____ ADMINISTRATION ____
PREPARED BY: Mr. L. Thomas Gailey

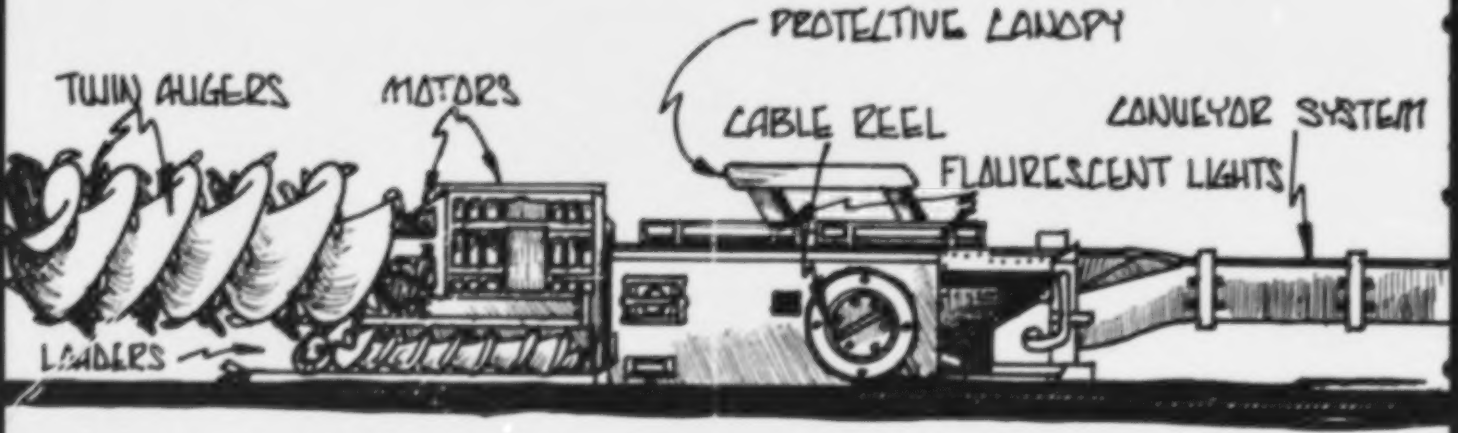
INFORMATION SHEET

Continuous Mining is the most popular mining system in the Appalachian Coal fields. This method produces large amounts of coal in a short period of time. However, there are certain drawbacks to the system that research has not yet solved.

Basically, continuous mining means that coal is continuously being removed from the face. The system depends on the operation of the continuous miner. There are four basic types of continuous miners: The cylindrical head miner, the boring-type miner, the auger-type and the chain ripper model.

All three of the following miners work on the wedge principle like loading machines used in the conventional method.

The Auger-type model (fig. #1) is most commonly used in seams of low coal. The twin augers in front tear away at the coal from side to side and force the coal onto the bottom where it is scooped up by a wedge and another set of small augers and forced onto a conveyor belt on the machine.



SIDE VIEW OF THE AUGER CONTINUOUS MINER
FIG. 1

The boring type miner has two rows of small arms mounted on the head. (Ten across the top and five across the bottom.) (See Fig. #2) Each arm has several steel or carbide bits which break the coal from the face and force it onto the bottom. These arms spin in complete circles. (The arms on the left of the illustration spin counter clockwise). The coal is forced onto the belt conveyor simply by moving (tramming) the machine forward. The wedge forces itself under the pile of coal and pushes the coal onto the conveyor.

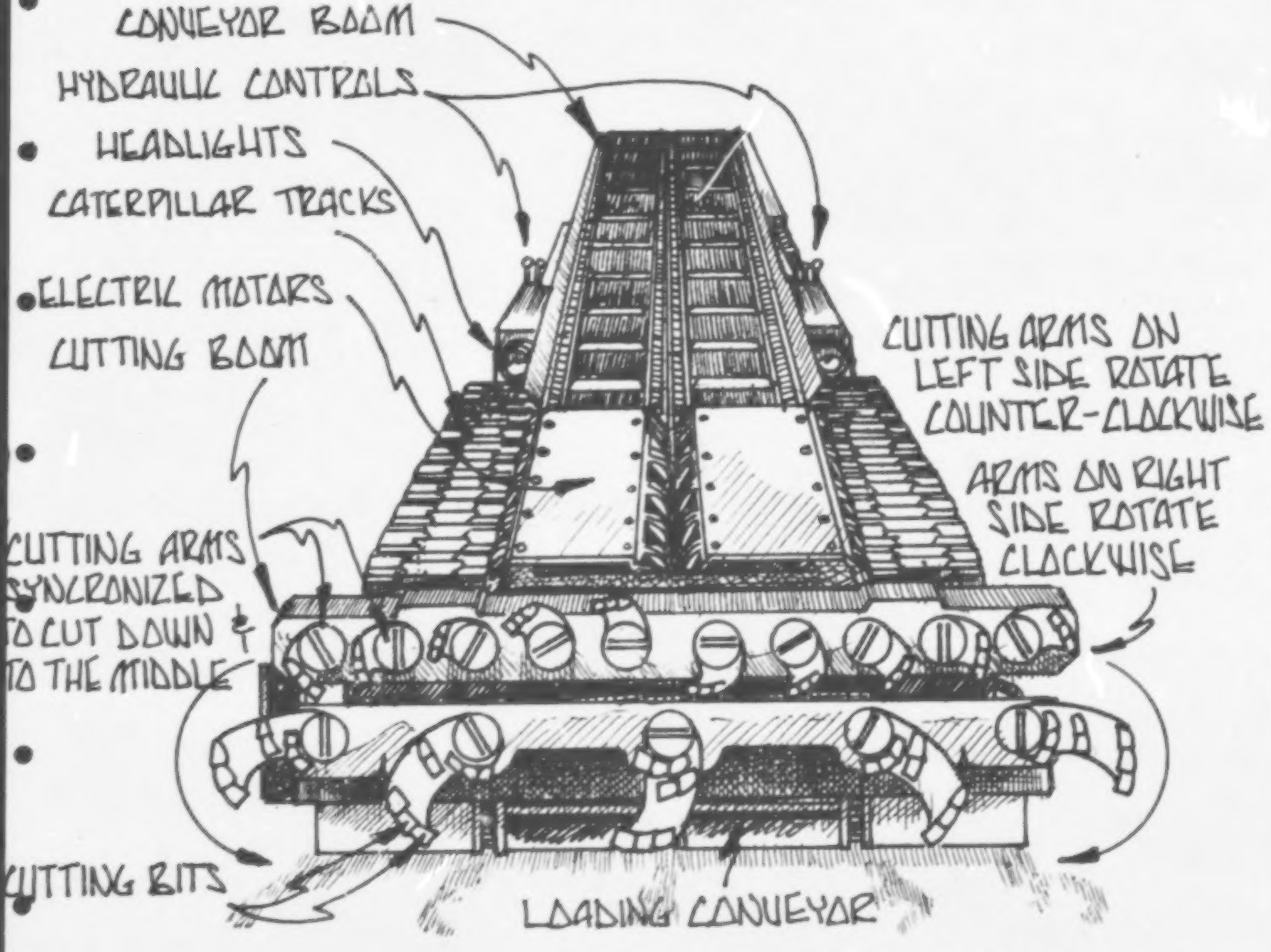

CONVEYOR BOOM
HYDRAULIC CONTROLS
HEADLIGHTS
CATERPILLAR TRACKS
ELECTRIC MOTORS
CUTTING BOOM
CUTTING ARMS ON LEFT SIDE ROTATE COUNTER-CLOCKWISE
ARMS ON RIGHT SIDE ROTATE CLOCKWISE
CUTTING ARMS SYNCRONIZED TO CUT DOWN & TO THE MIDDLE
CUTTING BITS
LOADING CONVEYOR

FIG.2 FRONT VIEW OF A BORING TYPE CONTINUOUS MINER

The next type of miner is the cylindrical head (or rotary drum) continuous miner. (See Fig. #3) This type is commonly used in average size coal seams since the head can tilt up or down to retrieve roof or bottom coal. The head is covered with many bits and spins toward the bottom. This movement knocks the coal onto the conveyor by sweeping mechanical arms (like a loading machine).

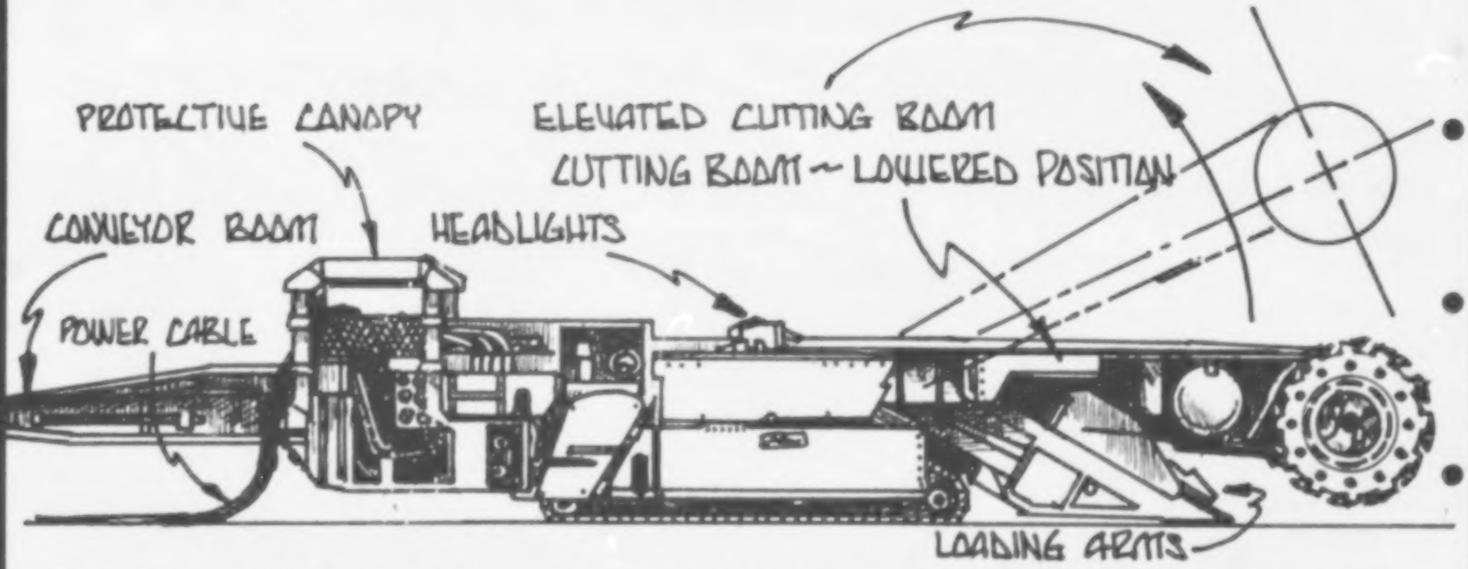

PROTECTIVE CANOPY
ELEVATED CUTTING BOOM
CUTTING BOOM ~ LOWERED POSITION
CONVEYOR BOOM
HEADLIGHTS
POWER CABLE
LOADING ARMS

FIG. 3 SIDE VIEW OF THE CYLINDRICAL HEAD CONT. MINER

The last type of miner (the chain ripper model) is the oldest type of continuous miner. (See Fig. 4) This model operates like five large chain saws placed side by side. The head is movable and contains five chains with cutting teeth which tear the coal and move it over the top of the head at high speeds. The head cuts a straight line from the bottom to the roof and forces the loose coal onto a conveyor belt that runs along the top of the miner.

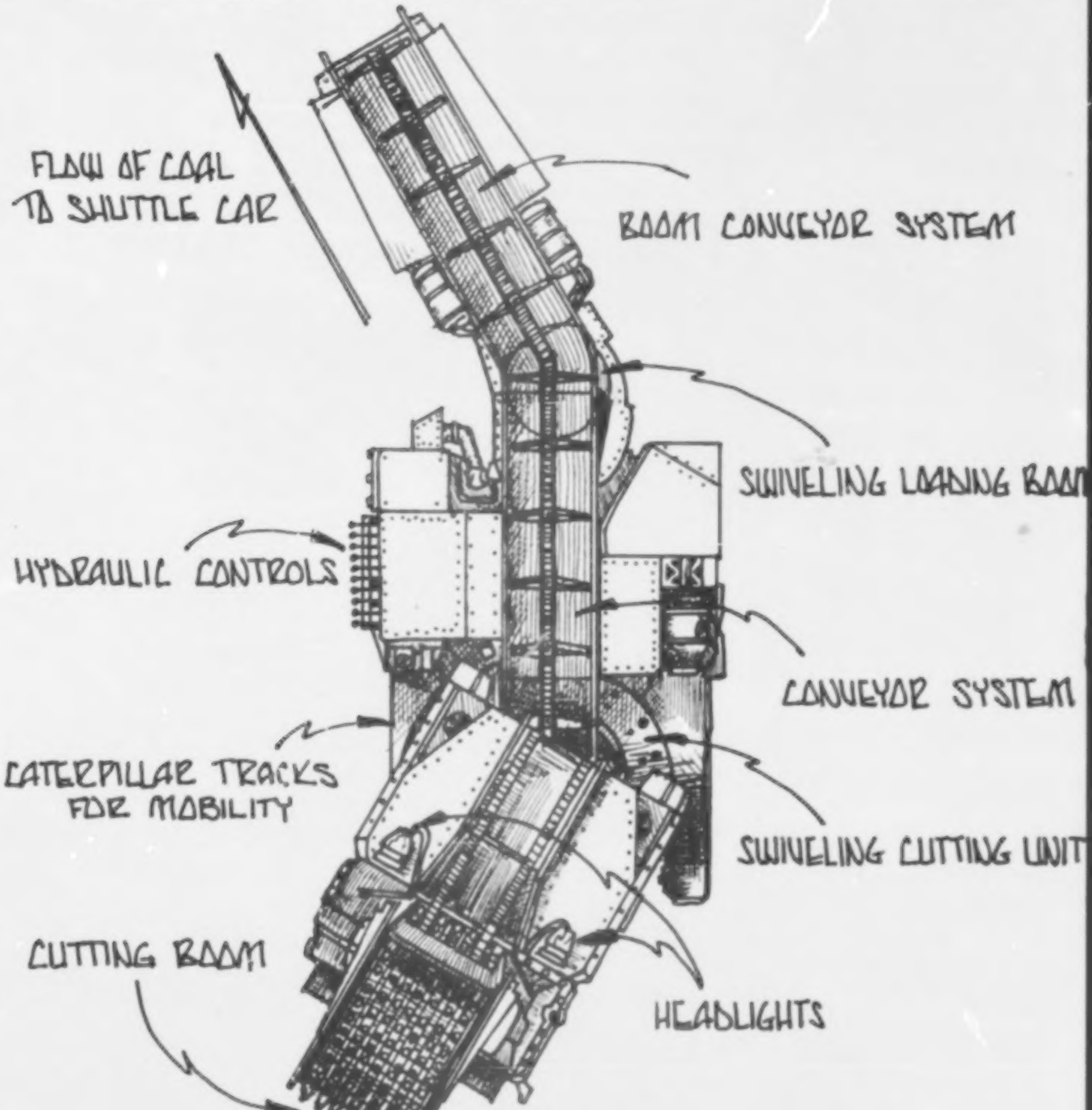

FLOW OF COAL TO SHUTTLE CAR
BOOM CONVEYOR SYSTEM
SWIVELING LOADING BOOM
HYDRAULIC CONTROLS
CONVEYOR SYSTEM
CATERPILLAR TRACKS FOR MOBILITY
SWIVELING CUTTING UNIT
CUTTING BOOM
HEADLIGHTS

FIG.4 TOP VIEW OF A CHAIN RIPPER CONTINUOUS MINER.

There are two methods of transporting coal from the continuous miner: conveyor belts and shuttle cars. Both methods are commonly used and the choice depends on height of the seam. Extensible conveyors are used to transport coal from the miner to the main belt since they may be extended easily as the miner advances. Shuttle cars (Fig. #5) are also used to transport coal from the miner to the main belt or loading dock. These shuttle cars contain a conveyor belt which is used in loading and unloading the car.

As mentioned earlier, the continuous mining process has several drawbacks. Valuable time (that could be used in producing coal) is used in setting roof support, waiting for shuttle cars to return and advancing the belt. Each of these steps is necessary to the production of coal, however they do interrupt the mining that might otherwise be actually "continuous".

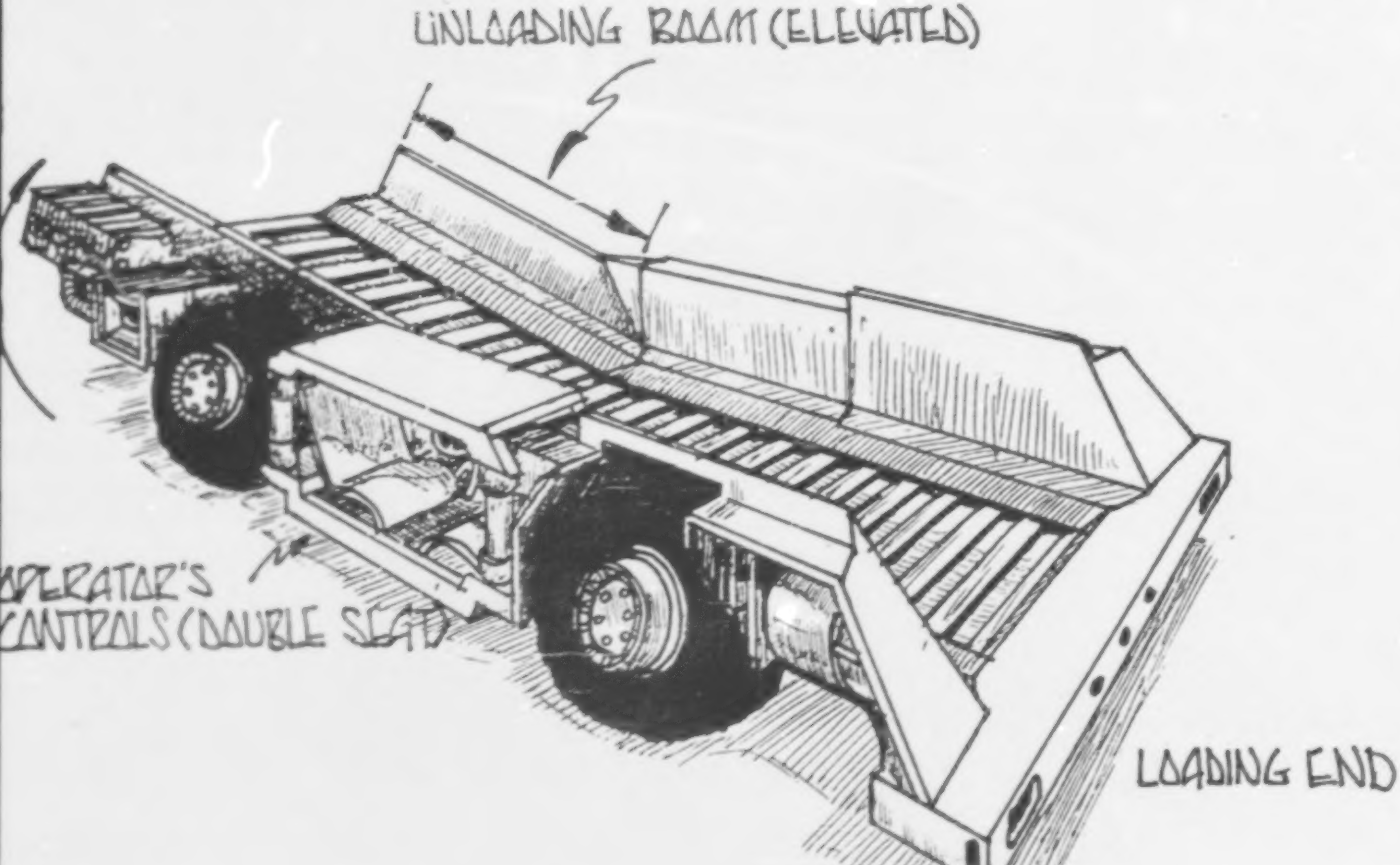
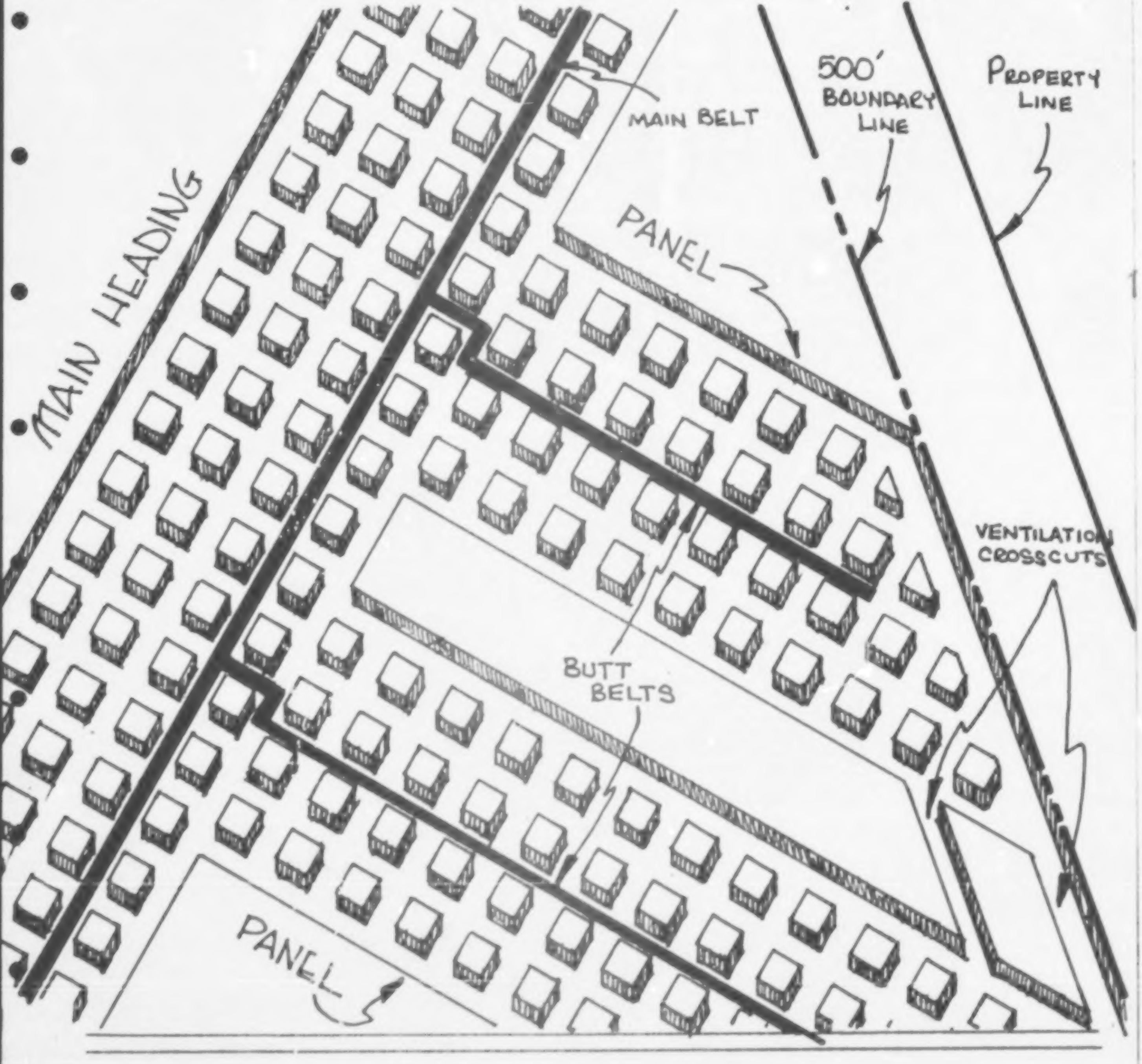


FIG.5 A TYPICAL SHUTTLE CAR

PROGRAM D-2 UNIT NO. 01 MODULE NO. 04 TASK NO. 020

FIG. 6 EXAMPLE OF A CONTINUOUS MINE


MAIN BELT
500' BOUNDARY LINE
PROPERTY LINE
MAIN HEADING
PANEL
VENTILATION CROSSCUTS
BUTT BELTS
PANEL

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2 STUDENT NAME ____________
UNIT 01 MODULE 04 TASK 030 INSTRUCTOR ____________
DATE COMPLETED ____________ INSTRUCTOR'S INITIALS ____________

TASK TITLE: *Scoop and Battery Tractors.*

Objective:

After studying the material, the student will identify scoop and battery tractors and describe the uses of those vehicles, by answering the review questions to 100% accuracy and to the satisfaction of the instructor.

Procedure:

1. Reread the Objective.
2. Study the information sheet.
3. Direct any questions, about the material, to the instructor.
4. Answer the review questions.

Review Questions:

1. Who may operate a scoop?

2. Are there any trailing cables attached to a scoop?

3. Why is there a ram located in the bucket of a scoop?

4. Who may operate battery tractors?

5. For what purpose is a battery tractor used?

ISSUE 1 DATE 6/7/77 P 1 OF 4
REVIEWED & APPROVED RESEARCH MSK INSTRUCTOR ____ ADMINISTRATION ____
PREPARED BY: Mr. Louis Christoff

PROGRAM D-2 UNIT NO. 01 MODULE NO. 04 TASK NO. 030

INFORMATION SHEET

Both vehicles to be described in this section are non-track hauling vehicles. Each vehicle is commonly seen in deep coal mines. The general worker will not be required to operate either piece of equipment but should be aware of their uses and location.

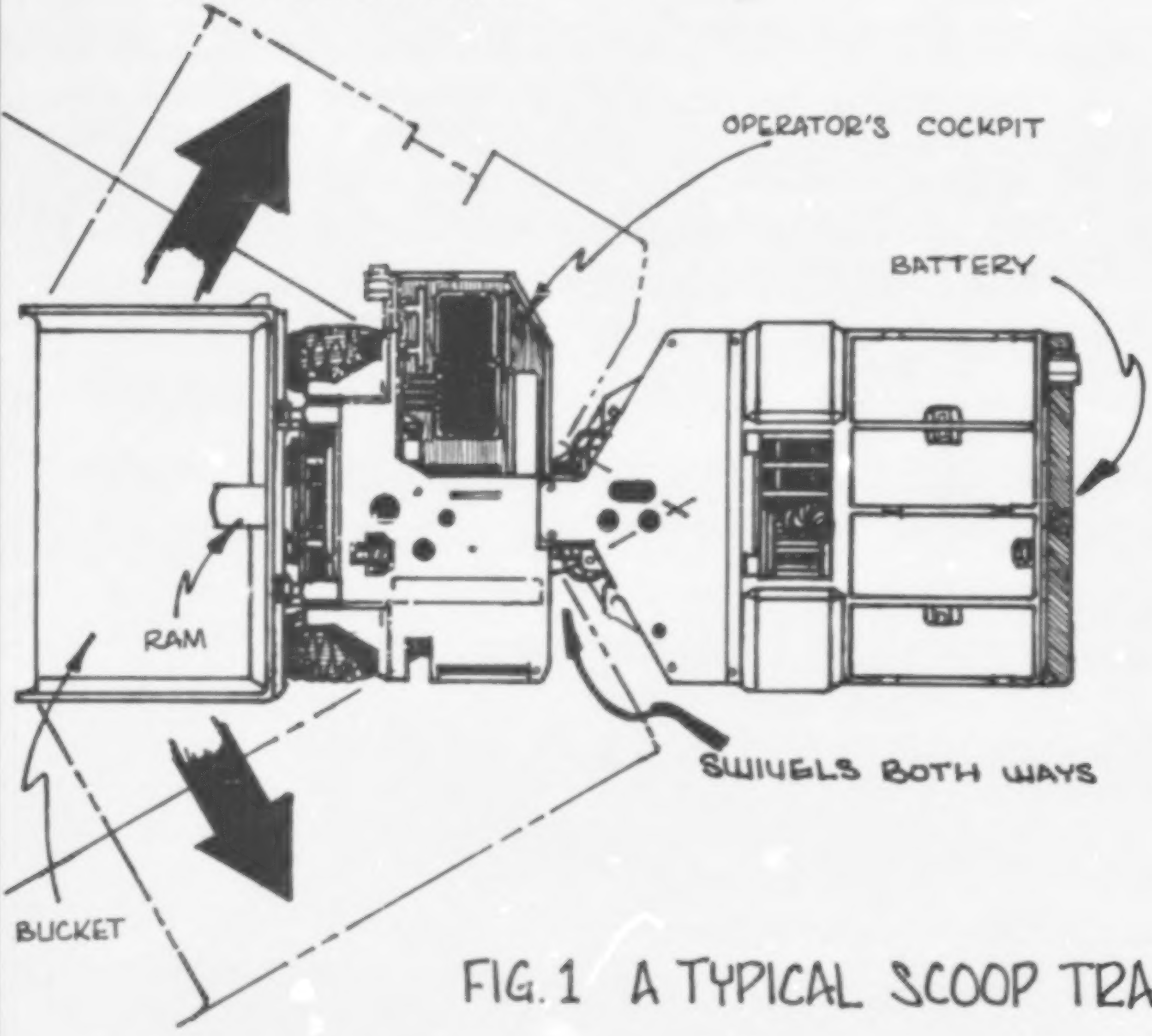
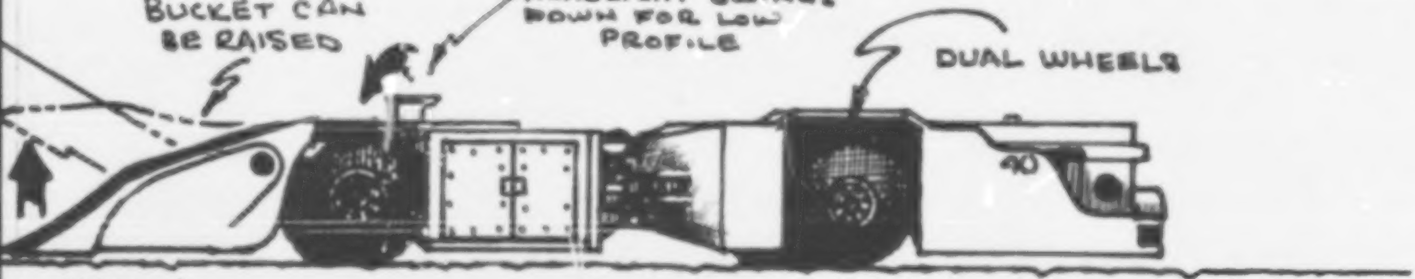

OPERATOR'S COCKPIT
BATTERY
RAM
SWIVELS BOTH WAYS
BUCKET

FIG. 1 A TYPICAL SCOOP TRACTOR


BUCKET CAN BE RAISED
HEADLIGHT SWINGS DOWN FOR LOW PROFILE
DUAL WHEELS
40

Scoop Tractor

A scoop tractor is used as both a lift and a bulldozer in underground mines. As shown in Fig. #1, the scoop has a large bucket in front which may raise or lower as needed.

The scoop has several basic duties: 1) it may be used for cleanup work after a roof fall or 2) the vehicle may be used to transport heavy equipment and materials from section to section or 3) the scoop may be used to load rock or equipment into track cars that will remove them.

In the center of the scoop's bucket is a large ram. Since space is limited in a mine and the equipment is important, the scoop cannot simply "dump" expensive equipment. After a large machine has been loaded (by moving the bucket under the machine) and moved to the location the scoop operator will simply advance the ram which will slowly push the machine off the bucket. Since this bucket naturally lays on the bottom (the bucket is raised when the scoop is moving) the equipment will not drop off the bucket, but simply slide onto the bottom. (However, this ram is only found on some models of scoops.)

The scoop is powered by a large storage battery which sits in the rear of the machine and is protected by armored plate steel. The bucket of the scoop may be raised or lowered and the front half of the machine can pivot to the right or left. The machine is fairly complicated and a general worker should not operate the machine unless in a emergency situation.

Battery Tractors

Battery powered "cars" are small vehicles used by mechanics, inspectors and electricians to transport their equipment and themselves from section to section. (See Fig. #2)

Many different types of battery vehicles are made. However, they are usually a one man vehicle, operating on three or four rubber tires and containing a small storage box for tools.

Most "cars" are very simple to operate and after only a few minutes any worker can learn the basic operation. Basically, they are moved in the same manner as a automobile with a automatic transmission.

The operator will sit facing the rib with his left hand on the steering wheel. A master switch energizes and de-energizes the machine and a second electrical switch indicates the direction in which the tractor or car will be moving (forward-neutral-reverse). Headlights are often found on kersey tractors as well. Two foot pedals (like an automobile) are also used: one is called a tram pedal and is used for accelerating the machine; the other is a brake which has a locking bar (for use when the operator leaves the machine.)

A tractor is generally hitched to the car for hauling men or equipment in non-track sections. (See fig. #3) Any worker may operate the tractor if he is authorized by a foreman but the vehicles are generally operated by mechanics, electricians or foremen.

PROGRAM D-2 UNIT NO. 01 MODULE NO. 04 TASK NO. 030

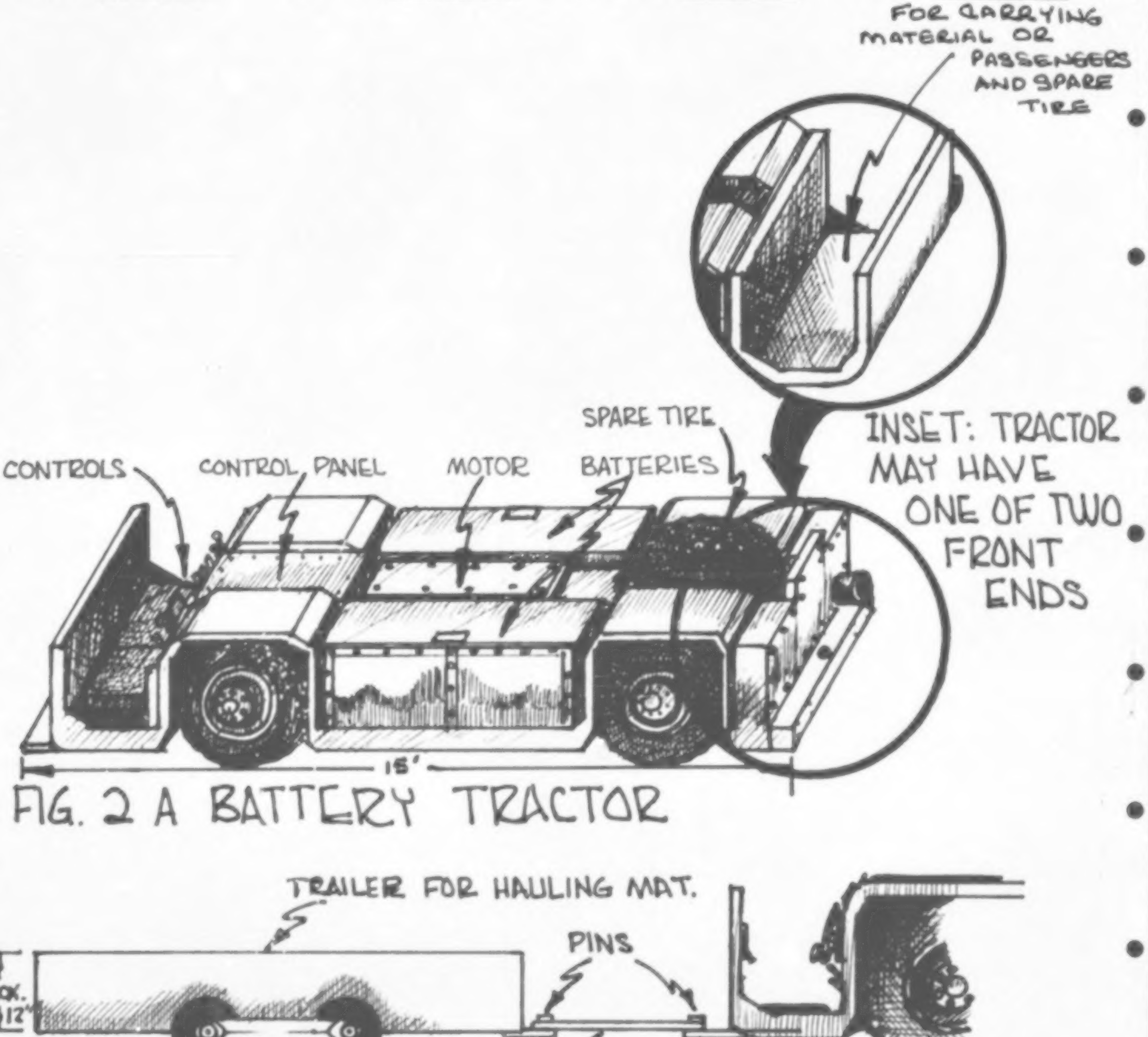

FOR CARRYING MATERIAL OR PASSENGERS AND SPARE TIRE
SPARE TIRE
CONTROLS
CONTROL PANEL
MOTOR
BATTERIES
INSET: TRACTOR MAY HAVE ONE OF TWO FRONT ENDS
15'

FIG. 2 A BATTERY TRACTOR

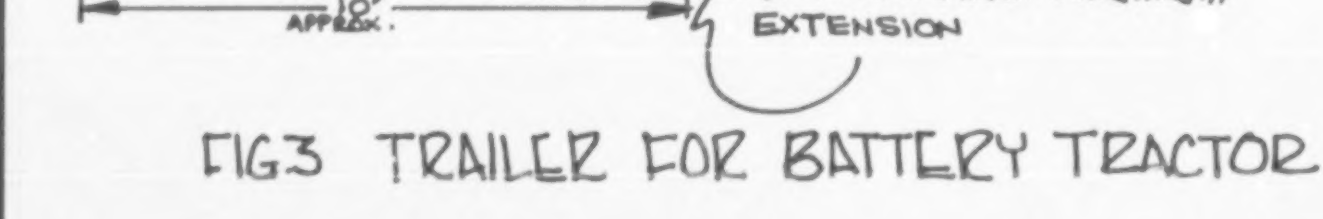

TRAILER FOR HAULING MAT.
PINS
APPROX. 12"
10' APPROX.
EXTENSION

FIG3 TRAILER FOR BATTERY TRACTOR

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2 STUDENT NAME
UNIT 01 MODULE 04 TASK 040 INSTRUCTOR
DATE COMPLETED INSTRUCTOR'S INITIALS

TASK TITLE: *Mining Systems: Longwall Mining.*

Objective:

After studying the information sheet and illustrations, the student will briefly explain the basic principles and equipment used in longwall mining by answering the review questions to 90% accuracy and to the satisfaction of the instructor.

Procedure:

1. Reread the objective.
2. Study the information sheet.
3. Review all illustrations.
4. Direct all questions about the material to the instructor.
5. Answer all review questions.

Review Questions:

1. Briefly describe a longwall mining system.
2. What are the advantages of longwalling?
3. Name the three major machines found at a longwall face.
4. What are chocks?
5. What is a "gob"?
6. Name two disadvantages of a longwall system.

ISSUE 1 DATE 5/19/77 P 1 OF 5

REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. L. Thomas Galley

PROGRAM D-2 UNIT NO. 01 MODULE NO. 04 TASK NO. 040

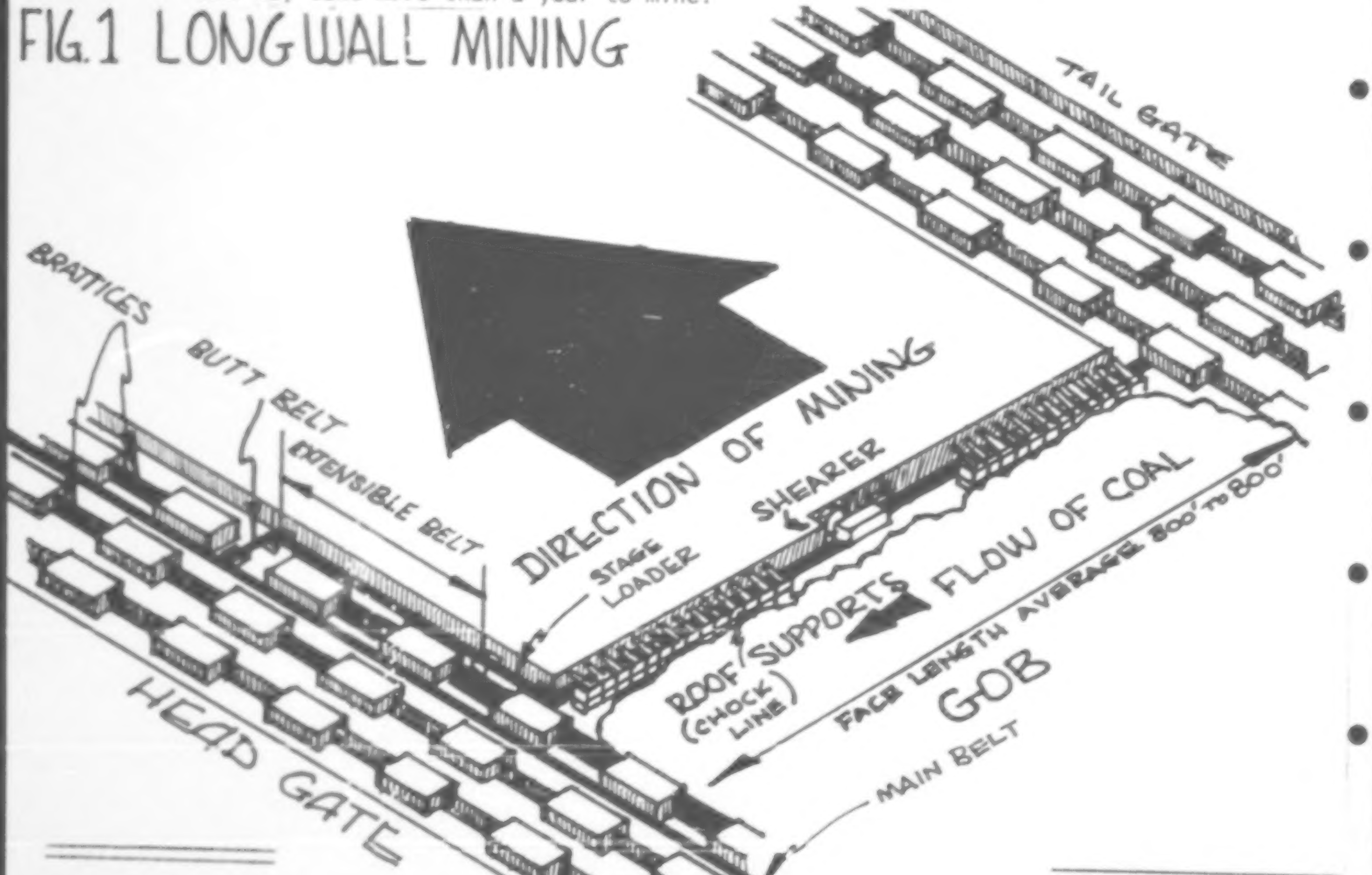
INFORMATION SHEET

Longwall mining has been used for many years in European Coal fields but is the most recent mining system of value in the United States. A longwall mining system is classified as being continuous and is designed as an "open-end" pillaring process. (leaves no stump) However, longwalling procedures can only be used in addition to standard continuous mining and cannot be used alone.

Several conditions must be present before a longwall system can be used: the seam of coal must be fairly high (about 50 inches) and the roof materials must be stable and solid. Standard entries are driven (minimum of three) and the crosscuts are completed. This work is done in the same manner as continuous mining. A second set of entries are driven the same length and direction as the the first set. The distance between the entry sets varies (due to roof conditions) but usually the distance is from 300 to 800 feet. Crosscuts connect the two sets of entries. One crosscut is driven at the place where the longwalling is to begin and the second crosscut is driven at the place where longwalling will end. (There is no set distance from these crosscuts. Some longwalling continues for several miles.)

As shown in figure #1, the pillar or block of coal is very large and may take more than a year to mine.

FIG.1 LONGWALL MINING


TAIL GATE
BRATTICES
BUTT BELT
EXTENSIBLE BELT
DIRECTION OF MINING
SHEARER
STAGE LOADER
FLOW OF COAL
ROOF SUPPORTS
(CHOCK LINE)
FACE LENGTH AVERAGE 300' TO 800'
GOB
MAIN BELT
HEAD GATE

The actual process of longwall mining can now begin.

All the equipment necessary to the longwall process is then moved into the crosscut and placed. There is a large amount of equipment and the process of setting this equipment may take a month or more.

The section, on the same side of the longwall pillar as main haulageway, is called the headgate. (The opposite side is called the tailgate.) The headgate contains all the hydraulic pumps and electrical controls for the entire longwalling operation. This section is also the loading place for the removed coal and contains an extensible conveyor belt which transfers the coal to the main belt.

The entire operation of a longwall depends on the shearer (Fig. #2). This machine is generally classified alone, but is basically the same as a continuous miner. The shearer has two round cutting heads, which spin and tear coal from the face and force it onto the bottom. The shearer is pulled along the face by a chain drive. Some models must retreat to the headgate after each cut has been made, but most recent models cut in both directions. The shearer rides on a track which performs several other important tasks. This track is called a pan line

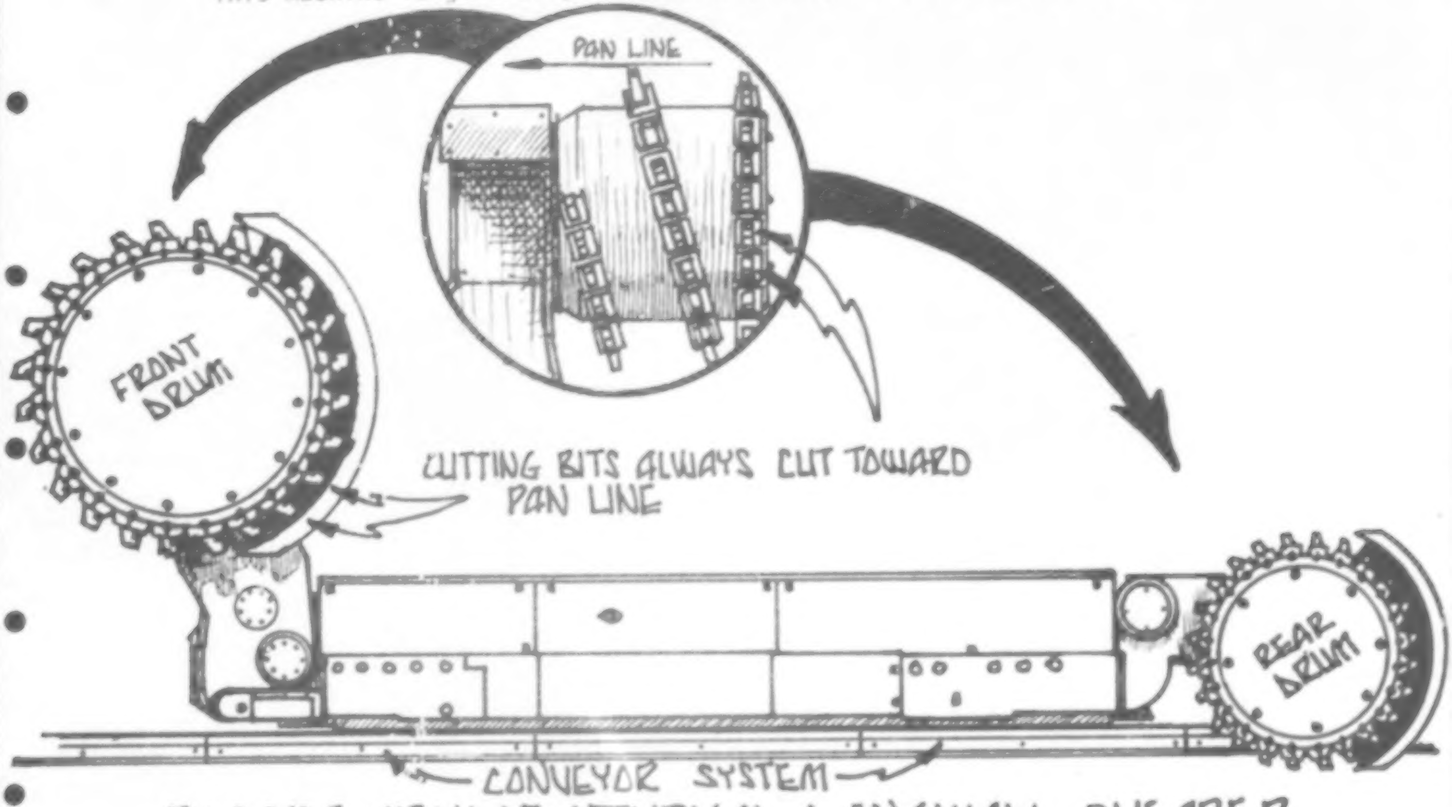


FIG.2 SIDE VIEW OF A TYPICAL LONGWALL SHEARER

PROGRAM D-2 UNIT NO. 01 MODULE NO. 04 TASK NO. 040

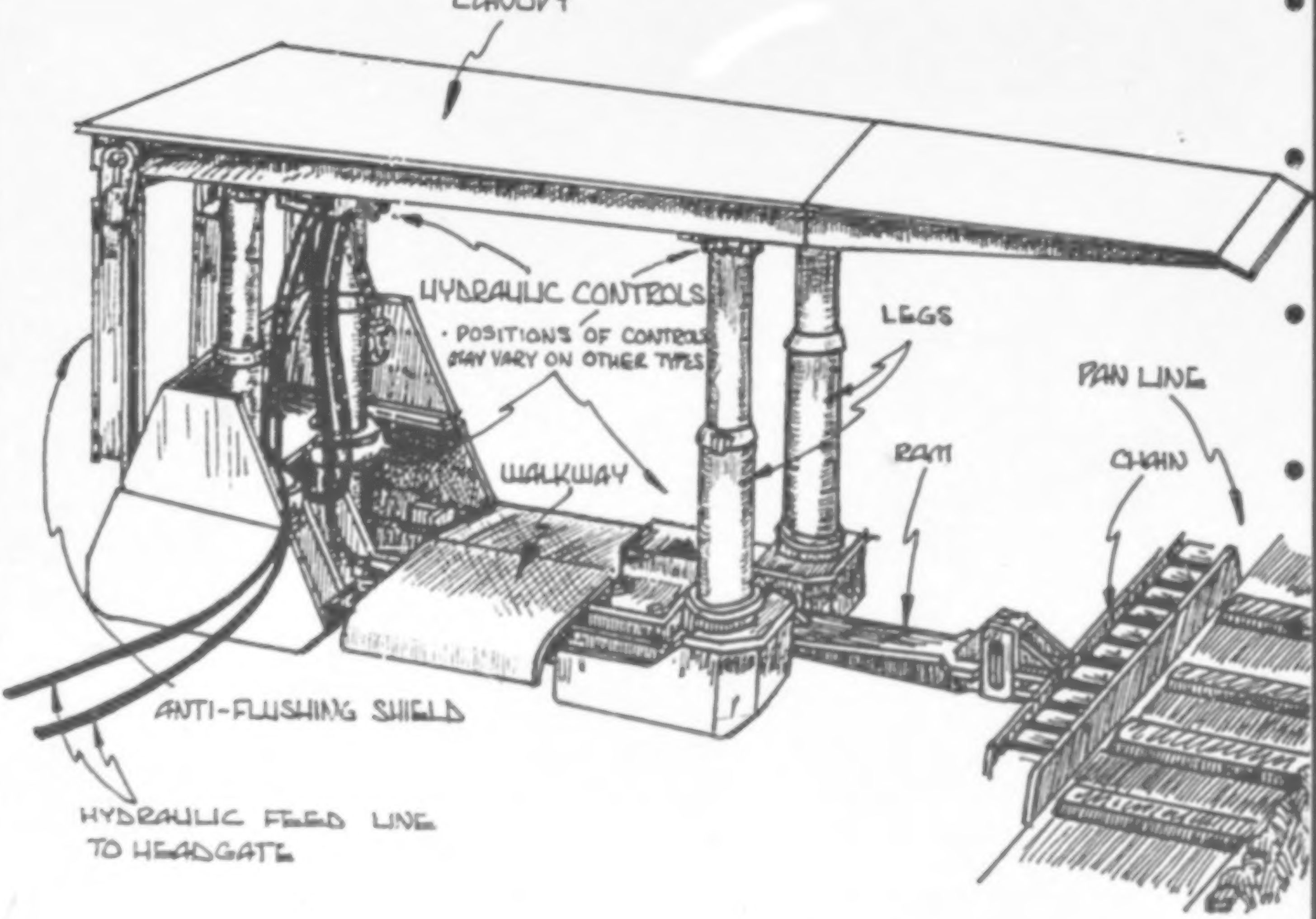

CANOPY
HYDRAULIC CONTROLS
· POSITIONS OF CONTROLS MAY VARY ON OTHER TYPES
LEGS
PAN LINE
RAM
CHAIN
WALKWAY
ANTI-FLUSHING SHIELD
HYDRAULIC FEED LINE TO HEADGATE

FIG. 3 CHOCK... PAN LINE, CANOPY & OTHER COMPONENTS

ISSUE: 1

and holds the face conveyor. (Therefore, when the shearer tears the coal from the face, the coal is removed as fast as it is cut.)

The pan line is attached to hydraulic roof supports called chocks. (See fig. #3) A row of chocks support the roof above the shearer, pan line, and workers. By operating the hydraulic controls of the chocks, the shearer and pan line may be advanced following every cut. The chocks are also pulled up to the face after the shearer has passed.

There are several reasons why longwall mining is a popular system. Since coal is being removed quickly and continuously (providing there is no breakage in the equipment), longwalling produces a large amount of coal in a short period of time. However, since a large amount of coal is being removed, there is a tremendous pressure on the roof. So the roof is permitted to collapse behind the chock line. (This area is called a "gob".) This "cave-in" relieves the pressure on the face and helps make longwalling a safe mining system.

But the equipment for longwalling is expensive, and may only be used easily if coal seams are high, fairly level and very large.

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2

STUDENT NAME

UNIT 01 MODULE 04 TASK 050

INSTRUCTOR

DATE COMPLETED

INSTRUCTOR'S INITIALS

TASK TITLE: *Pillar Recovery.*

Objective:

After studying the material the student will explain the basic principles and methods of pillaring to the satisfaction of the instructor, by answering the review questions to 100% accuracy.

Procedure:

1. Reread the objective.
2. Study the Information Sheet and illustrations.
3. Direct any questions, about the material to the instructor.
4. Answer all Review Questions.

Review Questions:

1. Briefly describe pillaring
2. What is a "stump"?
3. What is a "bleeder"?

ISSUE 1

DATE 5/24/77

P 1 OF 3

REVIEWED & APPROVED

RESEARCH MGK

INSTRUCTOR

ADMINISTRATION JMB

PREPARED BY: Mr. L. Thomas Gailey

PROGRAM D-2 UNIT NO. 01 MODULE NO. 04 TASK NO. 050

INFORMATION SHEET

Pillaring is a mining procedure used is all systems of underground mining. The process called pillaring or retreat work is simply the "taking" or "pulling" of coal pillars after the entries have been driven. To understand all the details involved in the pillaring process, the worker would have a college degree in mine engineering, but the basic idea is fairly simple.

In any mining system, the most important roof support are the pillars of coal that remain after the entries have been driven. Once these pillars have been removed, the roof will collapse.

Study Fig. #1. in this illustrated mine section A has been driven to the boundary line. The pillar of coal from the boundary line to the mine property line, will be the major roof support in this section. Since all of the entries have been driven to the limits, section A is now ready for pillaring.

Pillaring is always done toward the nearest main heading. Therefore the retreat will begin at the second row of pillars from the boundary line. The last row of pillars is left to support the bleeder. (A bleeder is a series of line rooms driven along the boundary line to permit air to travel over the gob area.)

Each pillar will be removed by a continuous miner (or by the conventional mining method). When using the continuous miner the operator will drive a cut straight diagonally through the pillar and split the coal pillar into two equal sections. The section nearest the "bleeder" is then removed. The second section of pillar is also removed by the continuous miner. In sections with bad roof, it may be impossible to remove the entire pillar. Often, a "stump" of coal is left. However, this stump may cause additional problems. The stump may support the roof well enough to increase the pressure on another nearby pillar. Or the stump may be forced into the bottom by roof pressure and cause the bottom to "heave" in nearby sections. For this reason, workers in a pillaring section follow a general rule: When the roof becomes dangerous, take one more fully loaded shuttle car of coal from the pillar. Though this rule may seem dangerous, it will be much safer for the entire section to remove as much of the pillar as possible.

Once the pillar has been removed the roof will collapse and form a gob. (If the roof is solid, it may hold steadily until several pillars are removed.) To protect the workers from the roof fall, a pillar section is well timbered. Airways are maintained and an escapeway is always open and marked.

During idle periods, the roof, rib and bottom may "work" due to the pressure on a pillar section and the equipment may be pinned by a roof fall or bottom heaving. Before idle shifts or vacations, all equipment is moved from the pillar section and the area around the equipment is heavily timbered.

Pillars are removed in order, but this order changes with different roof conditions. Once the order has been established by the mine engineers, the continous miner operator need only follow that specific order for removing pillars.

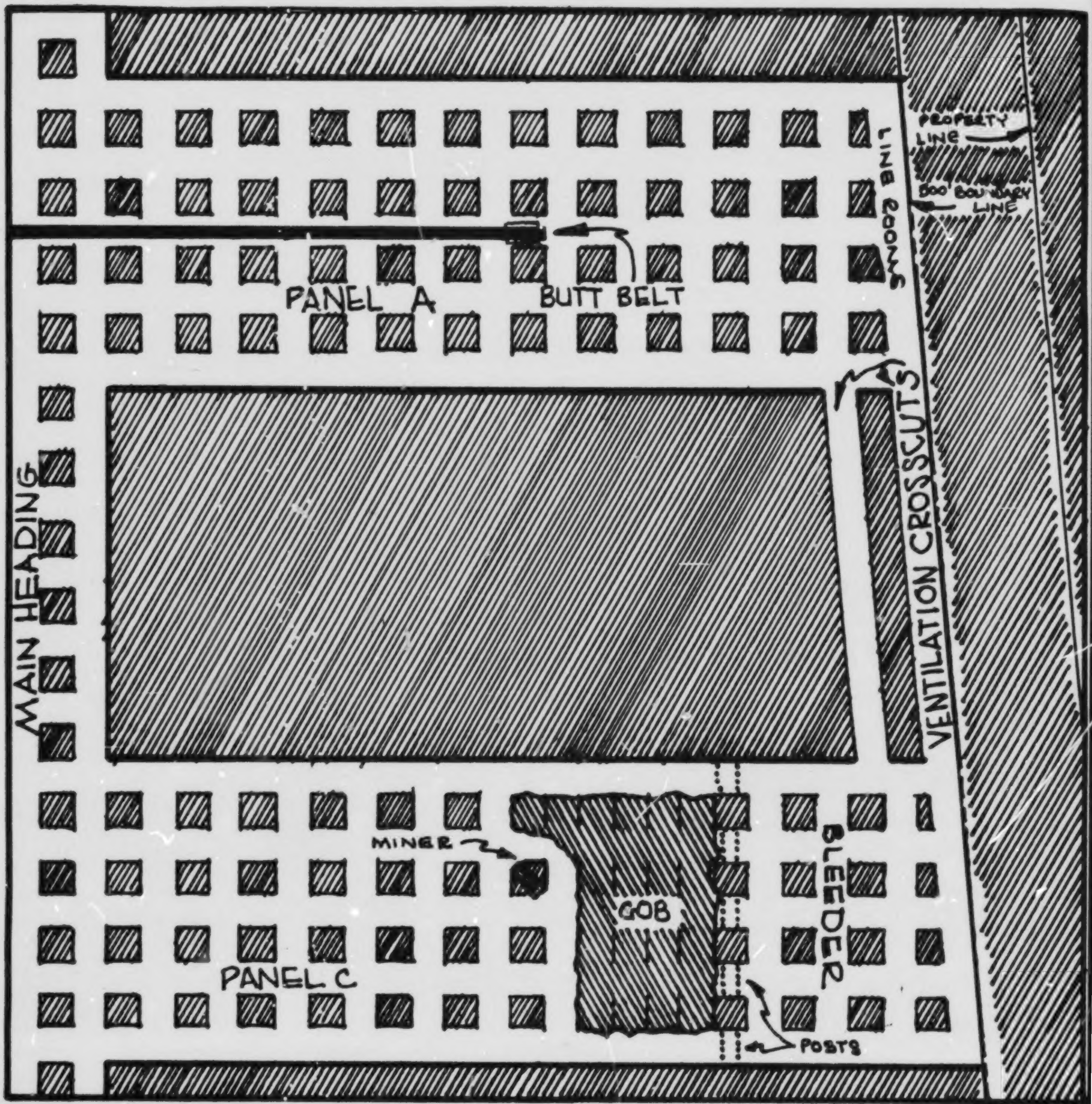

PROPERTY LINE
500' BOUNDARY LINE
LINE ROOMS
BUTT BELT
PANEL A
MAIN HEADING
VENTILATION CROSSCUTS
MINER
GOB
BLEEDER
PANEL C
POSTS

FIG. 1 EXAMPLE OF A CONTINUOUS MINING MAP

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
STUDENT NAME ____________
UNIT 01 MODULE 04 TASK 060
INSTRUCTOR ____________
DATE COMPLETED ____________
INSTRUCTOR'S INITIALS ____________

TASK TITLE: *Identify Common Mining Tools and Their Uses.*

Objective:

After studying the information sheet and illustrations, when given a mining tool by the instructor, the student will correctly identify it and it's uses to the instructor's satisfaction.

Introduction:

The general laborer within a mine, may be assigned to different crews and tasks each shift. Each new job crew has tools specifically designed for that job. (Belt, timbering, general face labor, etc.) There are many tools used for each position. The list of all of the tools used by a general laborer in a single year would be too long to mention. In this task sheet, only the more common tools and their uses will be listed.

Tools:

Axe
Hand pick
Long pick
Spade
Long handled shovel
Short handled shovel
Banjo
Clawhammer
Ball peen hammer
Adjustable wrench
Torque wrench
Lineman pliers
Utility knife
Belt knife
Hacksaw
Bucksaw
Come-a-long
Ratch-attachet
Ratchet
Spike bar
Slate bar
Roof jack
Hydraulic jack
Power pack

Procedure:

1. Read the objective several times.
2. Read the introduction at least twice.
3. Study the information sheet and the illustrations.
4. When given a tool by the instructor, identifiy the tool and tell what it is used for.
5. Return the tools to their proper storage.

ISSUE 1
DATE 6/20/77
P 1 OF 7
REVIEWED & APPROVED
RESEARCH ____ INSTRUCTOR ____ ADMINISTRATION ____
PREPARED BY: Mr. L. Thomas Galley

INFORMATION SHEET

Single-bladed axe: This is one of the most useful tools underground. The axe may be used to drive cap pieces above a prop (blunt end), chip coal from the floor to set props, or trim timber, etc. There are three basic safety precautions to be remembered when using an axe: 1) never attempt to cut anything you can't easily reach, since you may miss the object with the axe and injure someone, 2) when walking with an axe, grip the head as shown in the illustration and keep the blade facing the front of you, 3) if you have a sheath for your axe, use it! See Fig. #1.

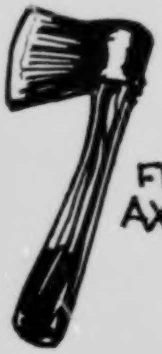


FIG. 1
AXE

Hand pick: This tool is used to trim loose material from the rib, or to test the roof conditions and should be carried in the same manner as an axe or worn on the workers belt with the pick end, forward. See Fig. #2.

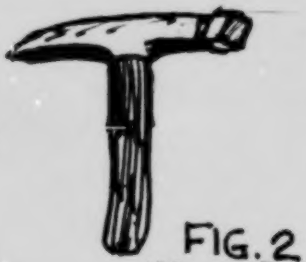
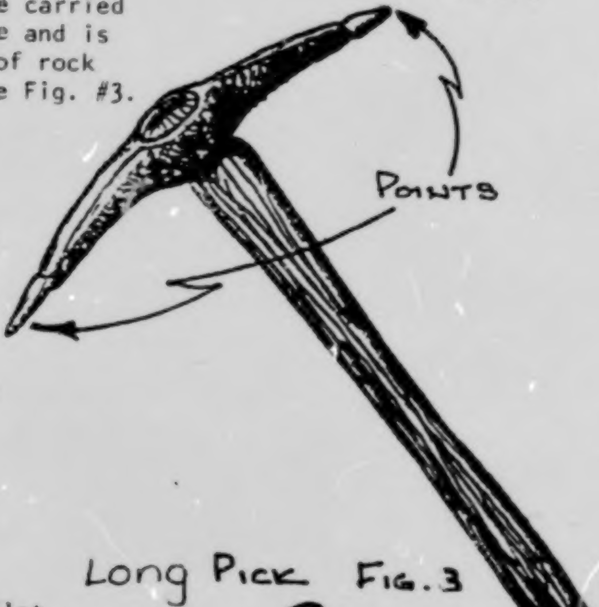


FIG. 2
HAND PICK

Long pick: This tool should also be carried in the same manner as an axe and is used to break small pieces of rock from the rib or bottom. See Fig. #3.



Long Pick Fig. 3

Spade: A spade is a tool having a flat blade and a long handle used to dig. See Fig. #4.

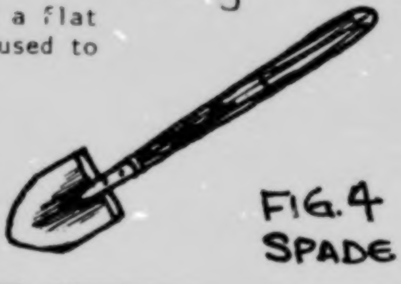
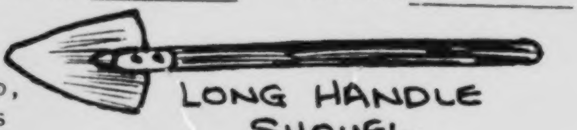


FIG. 4
SPADE



LONG HANDLE SHOVEL FIG.5

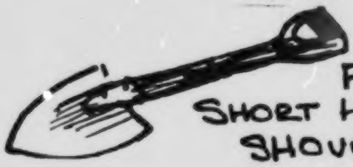
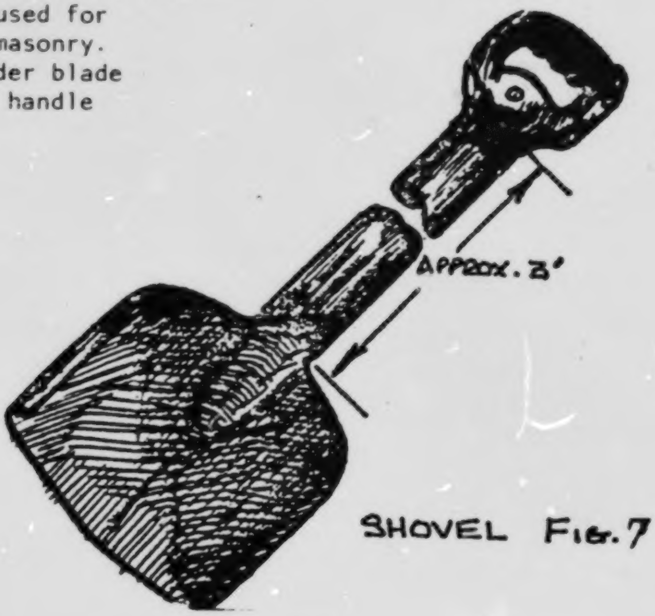


FIG.6 SHORT HANDLED SHOVEL

Shovel: A shovel is a tool with a broad blade slightly hollowed used to scoop, lift and throw loose material such as coal or rock dust. There are three basic types of shovels used in the mines: the long handle (fig. #5) the short handled (fig. #6) and the "banjo" (fig. #7). The long handled shovel is used primarily along beltways for returning loose coal to the belt. The short handled shovel and "banjo" are used for general face labor and masonry. (The "banjo" has a broader blade than the standard short handle shovels.)



SHOVEL FIG.7

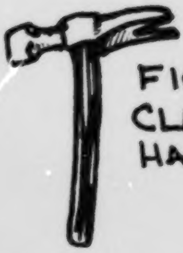


FIG.8 CLAW HAMMER

Claw-hammer: A claw hammer, often called a carpenter's hammer, usually has a strong hickery handle which is held in place by wedges driven into the handle to expand it. (New style claw hammers are made from one piece of steel, head and handle). Although the faces and claws may be different, they are all similiar. Keep the handle and face free of oil and grease, remove burrs from the faces, always grasp the handle near the end and strike the object squarely. Do not leave hammers lying around. You may know it is there, but others do not. See Fig. #8.

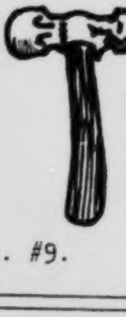


FIG.9 BALL PEEN HAMMER

Ball-peen hammer: The ball peen hammer, also known as the machinist's hammer, has a hardened face and peen, but the eye or hole in the middle is left soft. The face is rounded a little so that it will not leave marks. Ball peen hammers are made in different sizes determined by their weight and ranging from 1 ounce to 3 pounds without the handle. The most common are 4, 6, 8 and 12 ounces, 1 1 1/2 and 2 pounds. See Fig. #9.

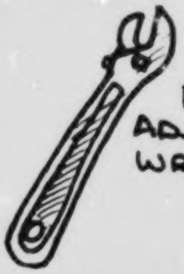


FIG. 10 ADJUSTABLE WRENCH

Adjustable-End Wrench: This is one of the most commonly used wrenches. They are made of forged steel or steel alloys, with smooth face jaws and are found in a variety of sizes determined by their length. The jaws are at an angle so that the wrench can be used in close corners and unhandy places. See fig. #10.

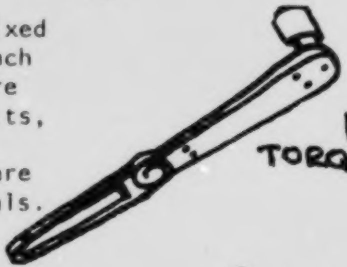


FIG. 11 TORQUE WRENCH

Torque wrench: A torque wrench is simply a fixed wrench with a meter attached. This wrench is used to test the torque (the pressure at which a bolt is twisted) of roof bolts, bolts fastening fire proof boxes, etc. The specific torque (in pounds per square inch) is mentioned in maintenance manuals. See Fig. #11.

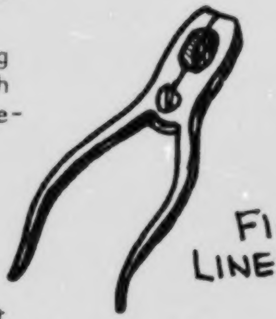


FIG. 12 LINEMAN PLIERS

Lineman pliers: Lineman pliers, commonly known as side-cutters, are made with the cutting edge on the same plane as the handles with heavy, square noses at the ends. The side-cutter pliers are used for cutting wire and nails. The heavy nose allows the electrician to use the pliers not only as a wire cutter, but also for bending, twisting and forming wire. See fig. #12.

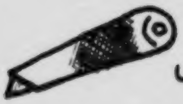


FIG. 13 UTILITY KNIFE

Utility knife: A utility knife is a small, pocket size knife generally with a retractable razor-sharp blade. Spare blades are carried inside the knife handle. To change the blade, the handle is removed, the old bade is carefully taken out and the new blade inserted. Since utility knives must be kept razor-blade sharp, workers must use extreme care when handling them. See fig. #13.

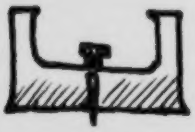


FIG. 14 END VIEW OF BELT KNIFE

Belt Knives: Belt knives, also known as belt jigs, cutter jigs or belt cutters, consists of a knife and a track and is used for squaring, belt before splicing. Once the tract is squared on the belt, the blade end rides the tract and cuts the belt. See fig. #14.

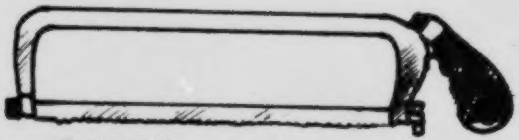
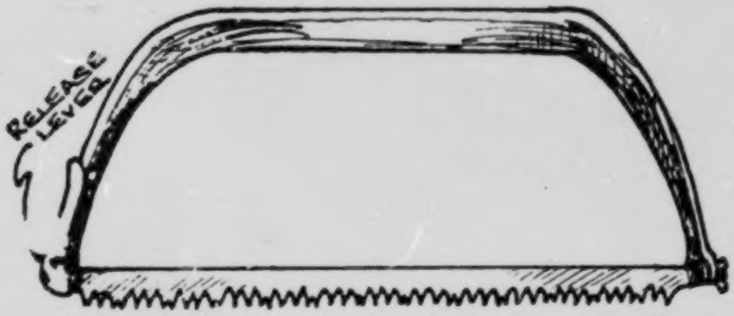


FIG. 15 HACKSAW

Hacksaw: A hacksaw is a fine-tooth saw with the blade stretched tight in a bow-shaped adjustable frame and is used for cutting hard materials. It is commonly used by electricians for cutting conduit and flexible armored cable. There are several types of hacksaws. If a large piece of mild steel bar is to be cut, use a large tooth blade. If a thin piece of metal is to be cut, use a blade having small teeth. See Fig. #15.

The blade should be placed so the cutting edge of the tooth is towards the front of the hacksaw. Only apply pressure on the forward stroke, not on the return stroke.

Bucksaw: The bucksaw is used for cutting timber and framing material for doors and brattices. It's long, shart teeth allow easier, faster cuts than a handsaw would. The handle ends are curved for a better grip and to provide tension, which keeps the blade taut or tightly drawn. The lever at one end is used to release tension and for changing the blades. See Fig. #16.



BUCKSAW FIG. 16

Come-a-long: A come-a-long is a device used to pull two heavy objects together. The objects which are hooked onto the come-a-long, are brought together by cranking the come-a-long lever in a ratchet-like manner. See Fig. #17.

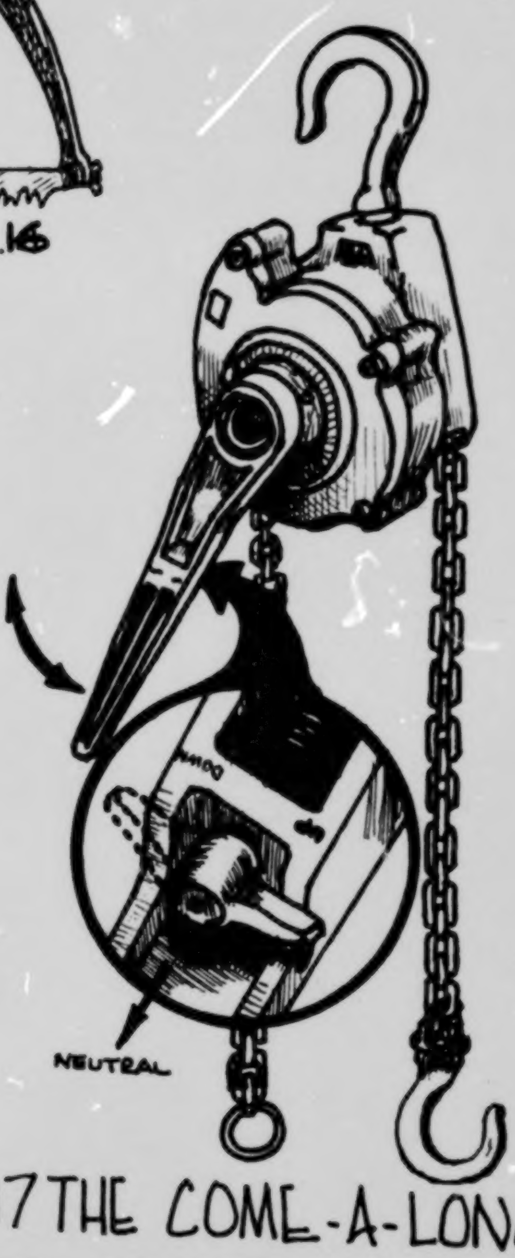


FIG. 17 THE COME-A-LONG

Ratch-attachet: A ratch-attachet is used for pulling the belt ends together for splicing. One belt end is laid over the roller, and tucked underneath. By pushing the handle down in a vise-like manner, the belt is locked in place. Another ratch-attachet is attached on the other belt end and a ratchet or come-a-long is used to bring the two ends together for splicing. See fig. #18.

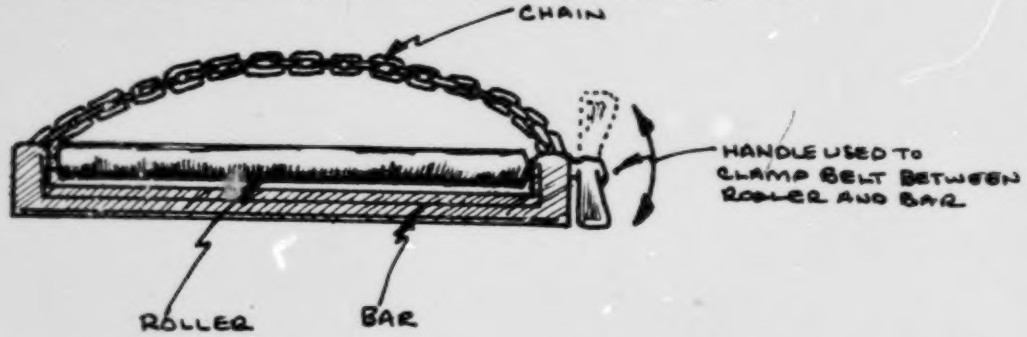
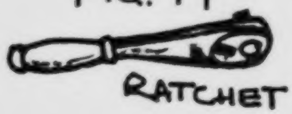


FIG. 18 A RATCH-ATTACHET

Ratchet: A ratchet is the handle used in combination with a socket which can provide either clockwise ration and slip in reverse ration or counterclockwise. See fig. #19.

FIG. 19



Spike bar: A spike bar is a long metal bar with a flat end and a wedged end. The flat end is used for tamping purposes (for tamping explosives or tamping rock underneath rock) and the wedged end is used as a pick. See Fig. #20.

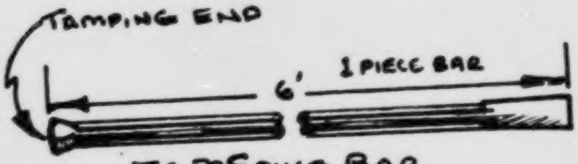
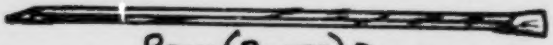


FIG 20 SPIKE BAR

Slate bar: A slate bar is a long-handled tool which is used to pry down loose and hazardous material from the roof, rib and face. See Fig. #21.



ROCK (SLATE) BAR
FIG. 21

Roof jack: A roof jack is a steel, screw - or pump-type hydraulic extension post used as temporary roof support. See Fig. #22.

Hydraulic jacks: Hydraulic jacks are simply small jacks used by mechanics for lifting equipment a few inches from the ground (when lubricating, repairing, etc.). To operate, the valve at the base of the jack is closed, the jack is placed between the bottom and the equipment, a rod is inserted into the handle and the jack is pumped to desired height. Once the valve is opened, the ram is released rapidly. See fig. #23.

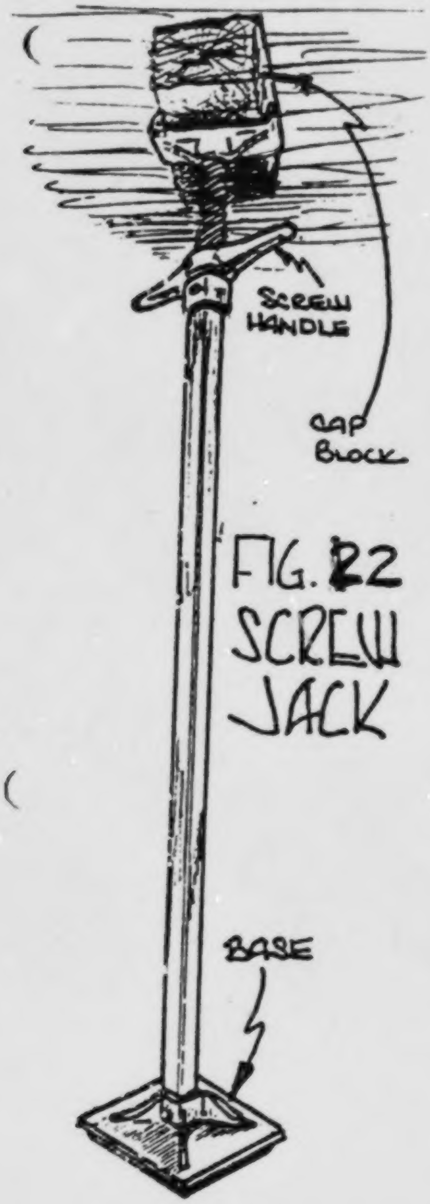


FIG. 22 SCREW JACK

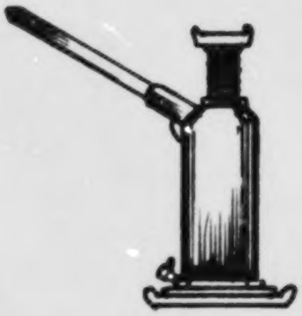
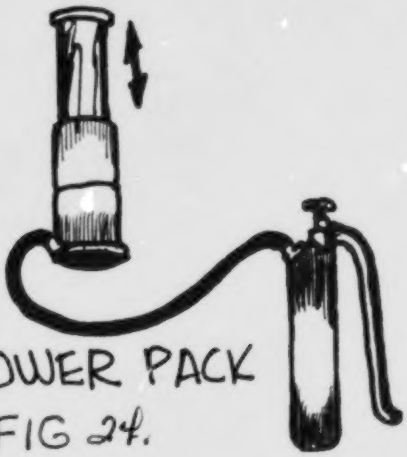


FIG. 23 HYDRAULIC JACK



POWER PACK FIG 24.

Power pack: A power pack, also called a portapower or portable hydraulic ram is simply a portable hydraulic jack used by mechanics for lifting heavy equipment parts, holding them tightly in position or moving them from tight places. To operate, the value stem is closed and the ram must be placed between to solid objects (the rib or bottom and the machine). As the handle is pumped, the ram will advance and force the object to move. For protecting the equipment, a cap piece may be inserted on the ram. See fig. #24.

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PROGRAM D-2 STUDENT NAME ____

UNIT 01 MODULE 04 TASK 070 INSTRUCTOR ____

DATE COMPLETED ____ INSTRUCTOR'S INITIALS ____

TASK TITLE: *Common Mining Terms.*

Objective:

After studying the material, the student will demonstrate his ability to define 90% of the terms given in the reveiw questions accurately and to the satisfaction of the instructor.

Introduction:

In every industry there are terms used to describe certain equipment and conditions. Each of the terms included in this task sheet, is common to the deep mining industry. Your effectiveness as a worker depends on a knowledge of these terms.

Procedure:

1. Reread the introduction.
2. Study the information sheet.
3. Briefly define each term in the review questions.
4. Direct any questions, about the material to the instructor.

Review Questions:

Briefly describe the (mining related) meaning of:

1. Bed -
2. Bottom -
3. Buggy -
4. Creep -
5. Draw slate -

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REVIEWED & APPROVED RESEARCH MSK INSTRUCTOR ____ ADMINISTRATION JMB

PREPARED BY: Mr. L. Thomas Gailey

6. Gob -

7. Heave -

8. Pillar -

9. Squeeze -

10. Timber -

INFORMATION SHEET

Bacon skins - Thin strips of metal, bolted to the roof, to hold loose rock in place.

Beam - A wooden or metal bar used to support a section of roof. (The beam is supported by two props or posts.)

Beam building - A method of roof bolting, used to connect several different layers of strata together to act as a single layer or beam.

Bearing plate - Plate used between the roof and the bolthead, in roof bolting.

Bed - The name given to an entire seam of coal or other specific material. (A bed of limestone, a bed of shale, etc.)

Bottom - The floor of a mine.

Break line - The line along which the roof is expected to break when collapsing during a "cave-in".

Breaker row - The row of timber, set to prevent the roof from collapsing any further.

Bridge - A structure which is constructed when an entry must be crossed without disturbing the air flow.

Bug dust - The fine coal dust produced when coal is cut from the face.

Buggy - A shuttle car.

Buglight - A flame safety lamp.

Cap block - A flat piece of wood placed between the prop and the roof for additional support.

Cap piece - A wedge-shaped piece of wood driven between the roof and prop to hold the prop in place.

Cavity - An opening or "pocket" in a seam.

Clay vein - A small seam of a clay like material that fills in a gap in a coal seam.

Creep - A condition that exists when the coal pillar is forced into the roof or bottom by extreme pressure.

Crib - A structure made of wooden beams laid in log-cabin style used to support sections of bad roof.

Crossbar - A beam of wood or metal that crosses an entry along the roof and is supported by two or more props.

Draw slate - A layer of slate, shale or rock up to two feet in thickness which will fall when the coal is removed.

Entry - Any tunnel driven underground.

Face - The wall of coal (or rock) at the end of an entry where the actual mining is done.

Fault - A fracture in the strata. (A fault is recognized when the coal seam ends suddenly and is found at a higher or lower level.)

Feeder - A machine which loads coal smoothly and evenly onto a conveyor belt.

Fireclay - A form of clay produced by decayed plants.

Fossil - The impression of an animal or plant found pressed into a rock or piece of coal.

Gob - The part of the mine where the coal has been removed and the section has been filled with rock.

Header block - A block of wood placed above a prop or post for the purpose of supporting an uneven roof.

Heading - A tunnel or entry.

Horseback - A piece of rock (shaped like a horse's back) in the roof.

Heave - A condition where the bottom will raise because of extreme pressure.

Immediate roof - The strata directly over the entry. (In normal conditions, this is the only layer of roof that must be supported.)

Kettle bottom - A round or bell-shaped piece of rock which may fall from the roof without warning.

King Rail - A large rail along the rib, used to support several crossbars at a time.

Lagging - Short pieces of timber or steel, placed side by side against the roof to prevent loose rock from falling.

Limestone - Rock formed in seams or beds by the decaying of plants or animals.

Main roof - The layers of strata above the immediate roof (may be several thousand feet thick).

Open-end pillar - A method of removing pillars in which no stump is left.

Outcrop - A section of a main seam or bed which is seperated from the main bed by erosion, earthquake, or mountain formation.

Overburden - All of the strata over a coal bed.

Packwall - A wall built from bottom to roof that splits the entire entry.

Panel - A section driven to the side of the main haulageway.

Pillar - A block of coal that remains, after the entries have been driven. (This block may be left to support the roof or removed by a process called "pillaring".)

Pinner - Name given to both the roof bolting machine and the operator.

Pot - A pot-shaped piece of rock which may fall from the roof at any time.

Prop or Post - A piece of timber that fits from bottom to roof and is used to support the roof.

Rib - The walls of the entry.

Roll - A section of an entry where the entry becomes lower due to a thickening of the roof or bottom strata.

Roof - The ceiling or top of an entry.

Roof bolt - A long steel bolt, placed into the roof, tightened and used to help support the immediate roof.

Roof jack - Any type of adjustable jack used as temporary roof support.

Roof sag - The bending or curving of the roof toward the bottom because of extreme pressure.

Room - A side entry.

Shale - A layer of strata formed by dirt, mud and clay which may separate and fall.

Sloughing - The slow flaking and falling away of material from the roof, rib and face.

Squeeze - A condition that exists when the coal pillar begins to break-up and flake because of extreme pressure.

Strata - All of layers of rock and material (combined).

Stump - A small section of coal left standing to help support the roof, after the rest of the pillar has been removed.

Sump - To move the head of a cutting machine or continuous miner into the coal face.

Suspension - A method of roof bolting, used to connect the weaker layers of rock to upper, stronger layers.

Timber- All of the support (except roof bolts) used to hold the roof of a mine stable.

Tram - The wheels or treads of face equipment or the process of moving equipment ("tramming" a miner).

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PROGRAM D-2
STUDENT NAME
UNIT 01 MODULE 04 TASK 080
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *The Properly-dressed mine worker.*

Objective:
After reading the material, the student will know what clothing to wear for maximum confort and safety when working underground to the satisfaction of the instructor by answering the review questions accurately.

Procedure:
1. Read the objective twice.
2. Study the information sheet.
3. Answer the review questions.

Review Questions:
1. Why should all clothing fit snugly?
2. Why should boots with a safety toe be worn?
3. What is the reason for wearing leg bands?
4. What equipment is generally worn attached to the workers' belt?
5. What clothing must the worker supply?

ISSUE 1
DATE 3/7/77
P 1 OF 3

REVIEWED & APPROVED
RESEARCH MSK
INSTRUCTOR
ADMINISTRATION

PREPARED BY: Mr. L. Thomas Galley

PROGRAM D-2 UNIT NO. 01 MODULE NO. 04 TASK NO. 080

INFORMATION SHEET

The amount and style of clothing that is generally worn in a particular mine, depends on specific mine conditions. Workers are generally informed before beginning the job what clothing is recommended. (Many mines or sections are extremely wet or cold. The worker should choose clothing suitable to these conditions.)

However, some general guidelines are established for the clothing and equipment worn by the worker. These personal items are listed as: 1) being supplied by the worker or 2) supplied by the company. (This listing may vary from company to company, since many owners have established their own guidelines for supply.)

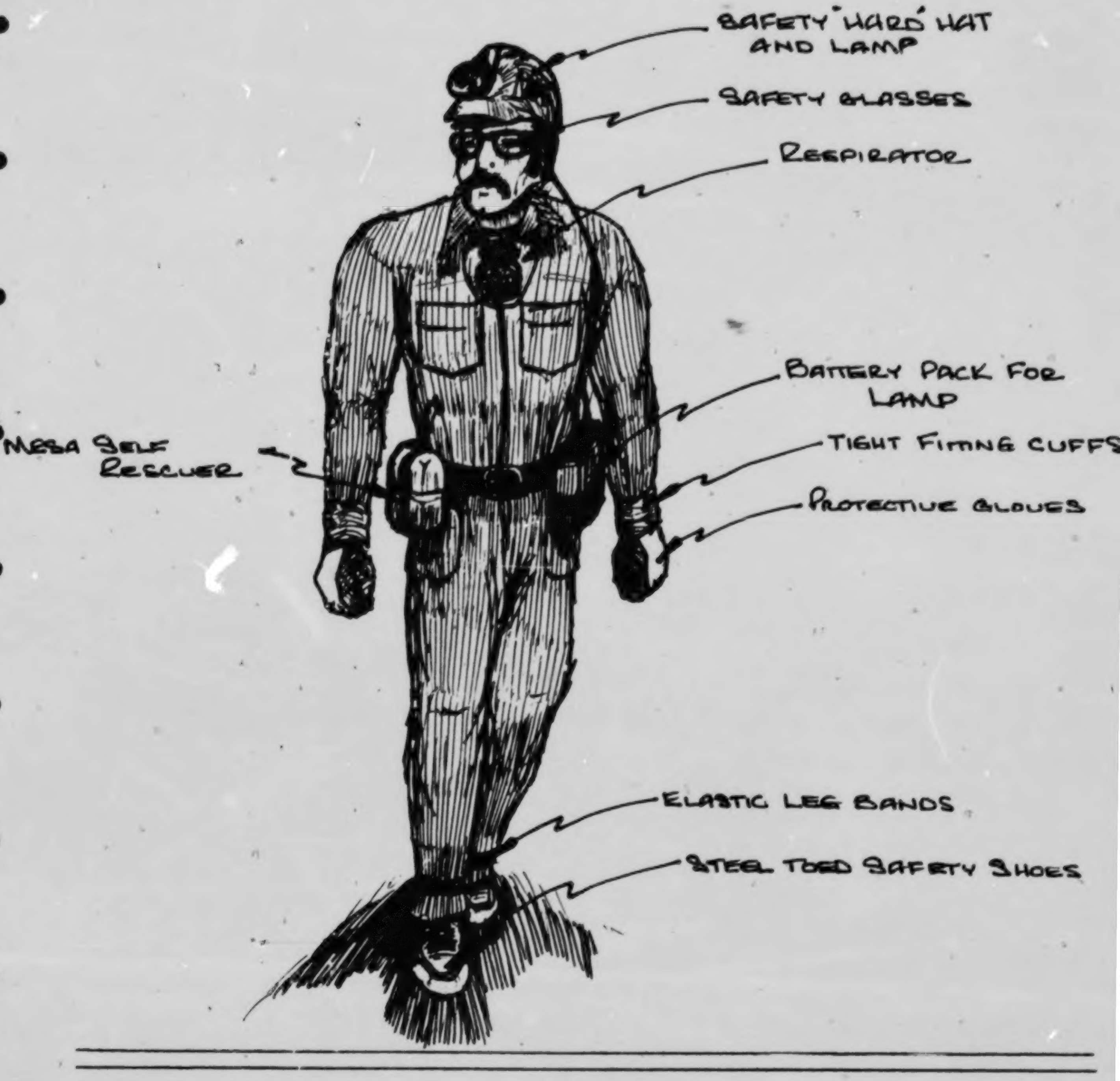
All personal clothing items are generally supplied by the worker. However, union workers are usually granted a clothing allowance each year by the company for the purpose of buying work clothes. These clothes may be of different styles but should fit snugly and be in good repair. (Loose or worn clothing may get caught in machinery and injure the worker.) Safety Boots (a metal toe is recommended) are also worn by the worker. Waterproof boots are helpful in wet sections and gloves are required when handling equipment which may cause damage to the hands.

Personal safety equipment is generally furnished by the company. Such equipment includes: Leg bands, respirator, safety helmet, lamp and battery pack, self-rescuer, utility belt and some form of eye protection. (For mines in need of prescription lenses, many companies have made arrangements with eyeglass manufacturers, and discounts may be available for safety prescription lenses.)

Federal law 75.1720 details the requirements for protective clothing. However, each job within the mine may require special equipment or clothing. The worker should follow the recommendations of experienced miners when choosing clothes for a particular job.

PROGRAM D-2 UNIT NO. 01 MODULE NO. 04 TASK NO. 080

THE "GENERAL MINER"


SAFETY "HARD" HAT AND LAMP
SAFETY GLASSES
RESPIRATOR
BATTERY PACK FOR LAMP
MESA SELF RESCUER
TIGHT FITTING CUFFS
PROTECTIVE GLOVES
ELASTIC LEG BANDS
STEEL TOED SAFETY SHOES

ISSUE: 1

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ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
STUDENT NAME
UNIT 01 MODULE 04 TASK 090
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *Lubricants and Lubricating Equipment.*

Objective:

After studying the material, the student will briefly explain the types of lubricants and lubricating equipment by answering the review questions to 100% accuracy and to the satisfaction of the instructor.

Introduction:

All major equipment within the mine requires lubricating. And since this equipment often generates a high level of heat, the lubricants are quickly "burned off" and must be replaced. Although most lubricating is done by mine mechanics, a general worker is often assigned the task of filling lubricant reservoirs in the equipment. For this reason, the general worker should be aware of the types of lubricants and lubricating equipment.

Procedure:

1. Reread the objective and introduction.
2. Study the information sheet.
3. Answer the review questions.
4. Direct any questions, about the material, to the instructor.

Review Questions:

1. Name the three basic types of lubricants found in the mine.

2. Define weight (as related to lubricants).

3. What is a "fitting"?

4. Where are lubricants stored underground?

ISSUE 1
DATE 6/16/77
P 1 OF 3
REVIEWED & APPROVED
RESEARCH
INSTRUCTOR
ADMINISTRATION
PREPARED BY: Mr. Michael Most

INFORMATION SHEET

There are three basic types of lubricants used in the mine: oils, grease and hydraulic fluid. Each type has a specific purpose and all three types may be used to lubricate a single machine. For this reason, an easy method of lubricant identification must be used, to aid the worker in selecting the proper lubricant for a specific machine part.

All lubricants are classified by their "weight". The "weight" shows the thickness of the lubricant and is usually given a number for easy identification. (For example, a #90 weight gear oil is extremely thick and is used to lubricate the large gears of heavy equipment. Hydraulic fluid is generally mixed with water and very thin.)

Most major oil companies produce machine lubricants and many "color-code" their containers for easy identification. (For example, a yellow container may indicate a certain weight of hydraulic fluid.) For this reason, most mining companies try to purchase all of their lubricants from the same company (to prevent the confusion of different lubricant identification).

The major storage areas for lubricants is located in the supply stations outside the mine. At the beginning of each shift, lubricating oil and grease is loaded onto flat bed cars, called low boys, and transported for temporary storage in underground working places. According to federal law 75.1104, the storage cars must be approved by the National Fire Protection Association. Grease gun cartridges are permitted to be stored in their shipping containers.

Federal law also requires the underground storage places to be of fire-proof construction; all sides, roof and floor composed of incombustible material. Concrete, concrete block, cinder block, or plastered wire-mesh fastened on a framework made from metal or flame retardant wood are aceptable. The floor must be composed of concrete so it will not absorb the spilled oil or grease and become flammable.

Fire resistant hydraulic oils need special storage. It is believed that the water in most emulsion-type oils evaporates from spilled pools and leave a highly flammable residue. Snythetic-ester and similiar fire-resistant hydraulic oils differ in composition and remain fire retardant after spillage.

With each piece of equipment, used within the mine, a instruction manual is given. In this manual, a section is written on the lubrication of that machine. This information includes; the location of all lubricating parts, fittings and reserviors, the specific type of lubricants used, and the suggested times for lubricating the equipment, (once every shift, once every week, etc.). Following this information carefully will help keep the equipment in proper working order.

There are several typical methods of lubricating mine machinery. Hydraulic fluid and lighter weight oils are generally poured directly into equipment reservoirs. However, the heavier weight oils are generally put into the machine with a suction gun. (Fig. #1) To operate this gun, the worker should simply stick the nozzle end of the gun into a can of the

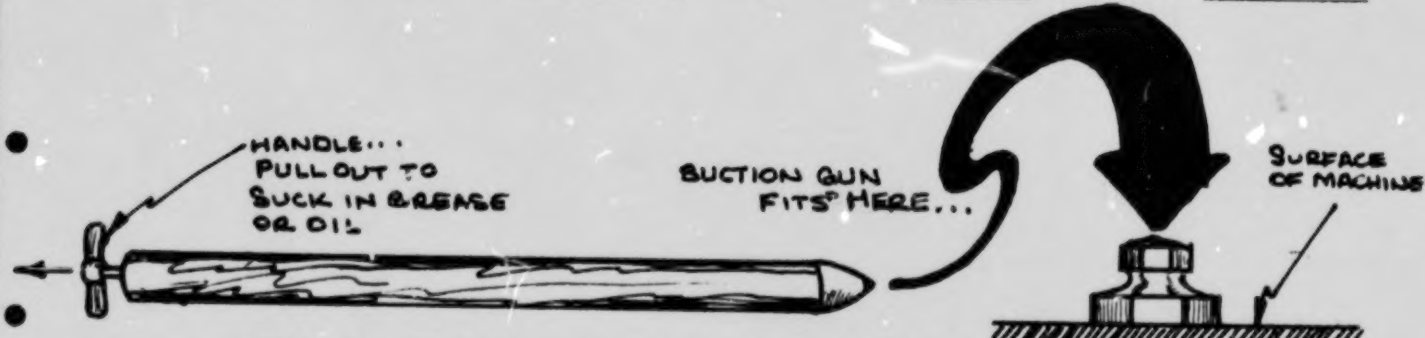

FIG.1 SUCTION GUN... & HOG'S EYE

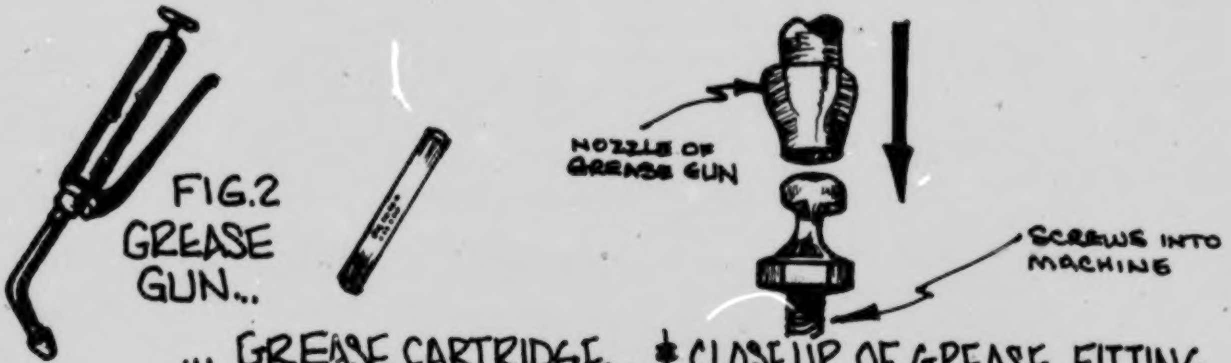

FIG.2 GREASE GUN... ... GREASE CARTRIDGE... & CLOSEUP OF GREASE FITTING

appropriate oil and draw the handle of the gun back. This action will fill the cylinder of the gun with oil. The worker should then insert the nozzle end of the gun into the proper fitting (often called a "hog's eye"). This action will force a valve open (in the fitting) and the worker may push the handle back into the gun,which will force the oil into the fitting.

The "gun" used in greasing equipment is also simple to operate. (Fig. #2) The worker must first insert a grease cartridge into the gun. To insert this cartridge: 1) Unscrew the rear cap of the gun and the push rod, 2) Remove the empty cartridge in the gun, 3) Remove both metal caps on the new cartridge and insert the cartridge, 4) pull the push rod back from the rear cap, and lock it in place (a locking device is found on the rear cap.) 5)Screw the rear cap onto the gun, unlock the push rod and force the push rod into the gun.

Once the cartridge has been replaced, the worker may "grease" the equipment (belt rollers, miner head, etc.) To grease, the worker need only attach the nozzle or tip of the gun to the proper fitting, pump the handle several times and remove the nozzle or tip from the fitting.

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PROGRAM D-2 STUDENT NAME ____________

UNIT 01 MODULE 04 TASK 100 INSTRUCTOR ____________

DATE COMPLETED ____________ INSTRUCTOR'S INITIALS ____________

TASK TITLE: *Permissible Explosives and Blasting Devices.*

Objective:

After studying the information sheet, the student will define explosive, detonators and blasting devices and briefly explain their types by answering 90% of the review questions correctly.

Procedure:

1. Read the objective several times.
2. Study the information sheet.
3. Answer all review questions.

Review Questions:

1. Define explosive.
2. Define detonator.
3. Define blasting device.
4. What requirements must an explosive meet to be qualified as permissible?
5. Who determines these requirements?
6. What requirements must a blasting device meet to be qualified as permissible?
7. Briefly differeniate between gelationous and nongelatinous explosives.
8. Where must the Cardox blasting devices be charged and serviced?

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REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. L. Thomas Gailey

9. Where can the Hydrox blasting devices be charged and serviced?

10. Must a miner have any qualifications before he is permitted to use explosives?

INFORMATION SHEET

An explosive is a substance capable of reacting chemically and rapidly expanding to a large volume. Most commerical explosives are sold in a solid form, but explosives can be liquids or gases. A detonator is a device to make another substance explode. It sets off the rapid chain reaction which results in an explosion. A blasting device is any material which consisting of a fuel and an oxidizer, is intended for use in blasting, does not contain any ingredients classed as an explosive by the Department of Transportation and can not be detonated by a No. 8 blasting cap.

Permissible Explosives, and Blasting Devices

Because of the high possibility of a gas or coal dust explosion, explosives used underground must have a brief flame life and a fairly low-flame temperature. Black blasting powder and mudcaps are prohibited by federal law 75.1300. (Explosives must be confined on at least three sides before blasting or it is considered mudcapping and illegal.) All explosives used underground must meet certain conditions and be approved by the U.S. Bureau of Mines.

According to federal law 75.1302, only permissible explosives (those approved by the U.S. Bureau of Mines), (Fig. #1) electrical detonators of proper strength, (Fig. #2) and permissible blasting devices will be used except when the Secretary or the Coal Mine Health and Safety District Manager gives permission for firing of more than 20 shots or the use of nonpermissible explosives. General requirements for permissible explosives are as follows:

1. The explosive must be approved by the Bureau of Mines.
2. Electric detonators must be at least as efficient as a No. 6 and have a charge of a 1-gram mixture of 80 parts of mercury fulminate and 20 parts of potassium chlorate.
3. The explosive must be stored in surface magazines and when underground, for not more than 48 hours.

General requirements for permissible blasting devices are as follows:

1. The blasting device must be approved by the Bureau of Mines.
2. The blasting device must not be discharged in the presence of firedamp.
3. The electrical unit must be approved by the Bureau of Mines.
4. The blasting device must not be fired until everyone is at a safe distance from the shot and protected by a cover having at least one right angle between them and the blast.

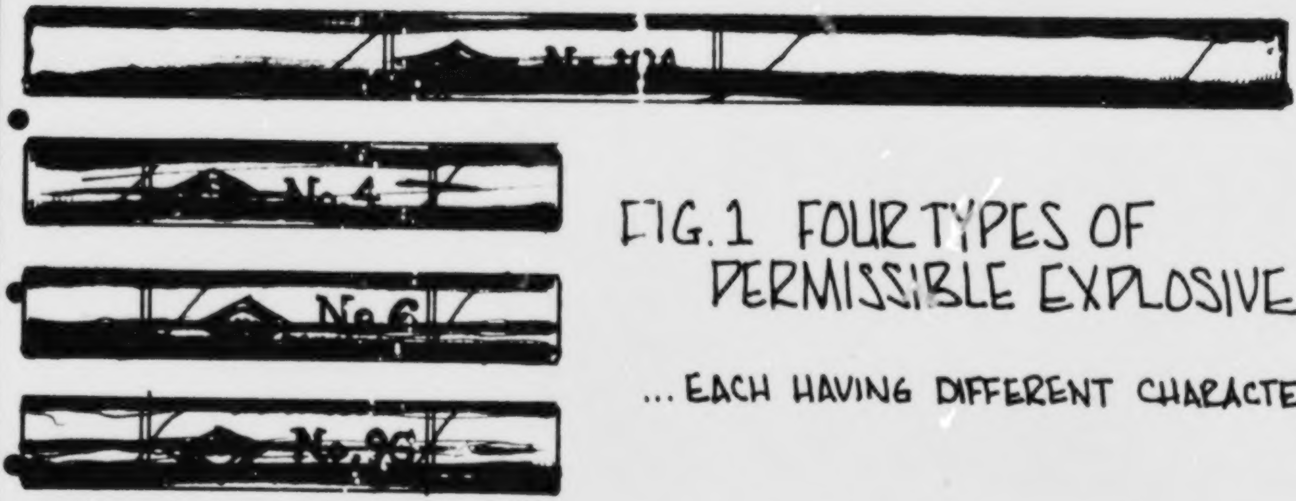

FIG. 1 FOUR TYPES OF PERMISSIBLE EXPLOSIVES...

...EACH HAVING DIFFERENT CHARACTERISTICS.

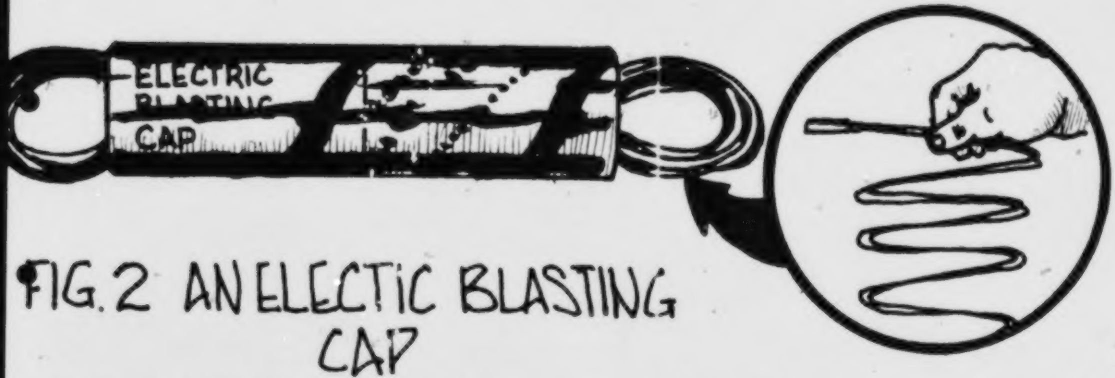

FIG. 2 AN ELECTIC BLASTING CAP

INSET: ELECTRIC BLASTING CAP WITH WIRES PARTIALLY UNFOLDED.

5. The coal to be blasted must be undercut or equally relieved, the length of shot holes must be at least 6" less than the depth of the undercut, and the shot must be at least 6" away from the face of an undercut.
6. No blasting device will be assembled or disassembled in a mine unless permission is stated in the approval.
7. A misfired blasting device may not be opened in the mine unless stated otherwise in the approval.
8. After a misfire has occurred, a 15 minute waiting period is required before any personnel are allowed to return to the face.

General Types of Explosives and Blasting Devices

When referring to permissibles, a distinction is made between gelatinous and nongelatinous explosives. Nongelatinous explosives are used in mines that are relatively dry. These explosives should not be exposed to damp atmospheres because the moisture absorbed causes them to lose their strength.

Gelatinous explosives are better adapted for use in wet mines. They are very dense and provide more energy for a given volume of borehole charge. Although they are designed especially for blasting rock in coal mines, they are also suitable for blasting coal.

The current list of permissible explosives includes 159 different brands. Of these, 19 are gelatinous.

The active list of permissible blasting devices include nine Cardox models and two Hydrox models. Both devices used high-pressure discharges from a pressurized shell in the shothole. The high-pressure gases made are released at high velocity by the shearing of a disk at the discharge head.

The Cardox blasting device uses liquid carbon dioxide as the blasting agent. It is made into a gas state by the heat produced from an electrically ignited heating element consisting of a potassium perchlorate and coal mixture immersed in the liquid carbon dioxide. The Cardox model must be charged and serviced at the surface.

The Hydrox blasting device uses a gas-generating charge of ammonium nitrate changed into gaseous products by a pressurized chemical reaction. An electrically ignited chemical heater embedded in a starter mixture initiates the charge. The Hydrox is permitted to be charged and serviced underground.

When using short-delay detonators, the blasting accessories should include the following:

1. Short-delay copper-shell detonators of the proper periods of the same manufacturer, with copper leg wires or with iron leg wires not more than 16' long.
2. A permissible short-firing unit approved for short-delay blasting and able to fire all shots in the round.
3. A shot-firing cable of at least No. 16 gage insulated, duplex copper wire, 100 to 150' long, held on a nonmetallic reel.

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PROGRAM D-2

UNIT 01 MODULE 04 TASK 110

DATE COMPLETED

STUDENT NAME

INSTRUCTOR

INSTRUCTOR'S INITIALS

TASK TITLE: *Transportation and Storage of Permissible Explosives and Detonators.*

Objective:

After studying the information sheet, the student will explain the proper procedure for transporting and storing permissible explosives and detonators by answering the review questions to 90% accuracy.

Procedure:

1. Read the objective several times.
2. Study the illustrations and the information sheet.
3. Answer all review questions.

Review Questions:

1. Name 5 methods used to transport explosives and detonators.
2. Whether moved by a person or a machine, in what are explosives and detonators transported?
3. When transporting by belts, how many feet must be kept between containers?
4. Who may ride a trip carrying explosives and detonators?
5. How long must be allowed between trips?
6. What is the time limit on storing explosives and detonators underground?
7. Define: magazine.
8. Where are magazines kept when normal location requirements cannot be met?

ISSUE 1

DATE 5/24/77

P 1 OF 3

REVIEWED & APPROVED

RESEARCH

INSTRUCTOR

ADMINISTRATION

PREPARED BY: Mr. Louis Christoff

9. How far from any pipeline, powerline, rail or conveyor can explosives be stored in niches in the rib? In working places? In working sections?

10. Except where they are stored in the same magazine and seperated by 4" hardwood, how far apart must explosives and detonators be kept?

INFORMATION SHEET

Carrying and Transporting Explosives and Detonators

Explosives and detonators carried anywhere underground must always be in special, separate containers made of a non-conductive material, maintained in good condition and kept closed.

Cars moved by locomotives or ropes, belts, shuttle cars and specially designed equipment are used to transport explosives and detonators. No person, besides the operator, is permitted to ride with them, and trips must not follow any other trip for at least 5 minutes. Where belts are used, 18" of minimum clearance must be kept between the belt and the overhead. A distance of 5' must be kept between the belt and the overhead. A distance of 5' must be kept between containers, and the belt speed must not exceed 300' a minute. (Federal Law 75.1305.)

Whether they are transported by a person or a machine, explosives and detonators must always be kept in seperate closed containers.

Safety Tips To Be Used When Carrying Explosives and Detonators

1. Always use the provided rubber lined shoulder bags.
2. Never carry caps and explosives in the same container. They must be kept at least 5' apart.
3. Gloves should be worn when handling explosives and detonators. Because dynomite has the tendency to sweat nitroglycerine, a powerful oily liquid explosive, do not touch exposed skin, especially the face or head as severe headaches result.
4. Do not place explosives or detonators on trolley wire side or feeder cable. Keep them away from any kind of energized circuits.

Storage of Explosives and Detonators

Explosives and detonators must be checked for good condition and used within 48 hours after being taken underground. They are stored in separate section boxes, termed magazines, not less than 5' apart. (Federal law 75.1306.) Magazines, usually constructed of cement block with metal doors, are backed on the inside with wood, so no metal is exposed. They must be located 5' from any pipeline, powerline, rail or conveyor and at least 25' from roadways and power wires in dry, well rock dusted areas protected from roof falls. (Federal law 75.1306)

Where it is impossible to comply with these requirements, boxes or magazines are kept in closed, separate containers in niches cut into solid coal.

When the explosives are kept in niches in the rib, they must be at least 5' from any pipeline, powerline, rail or conveyor. They must be located out of the line of blast, more than 50' from the working face and 15' from any pipeline, powerline, rail or conveyor.

The only way explosives and detonators can be stored in the same magazine is if they are separated by 4" hardwood partitions. (Federal law 75.1306)

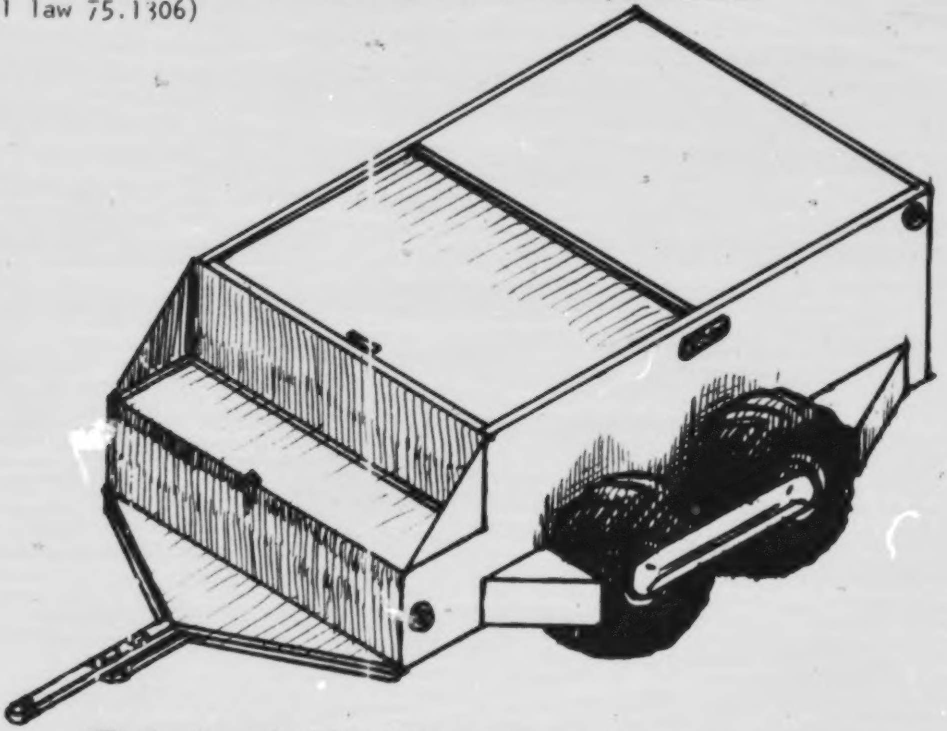
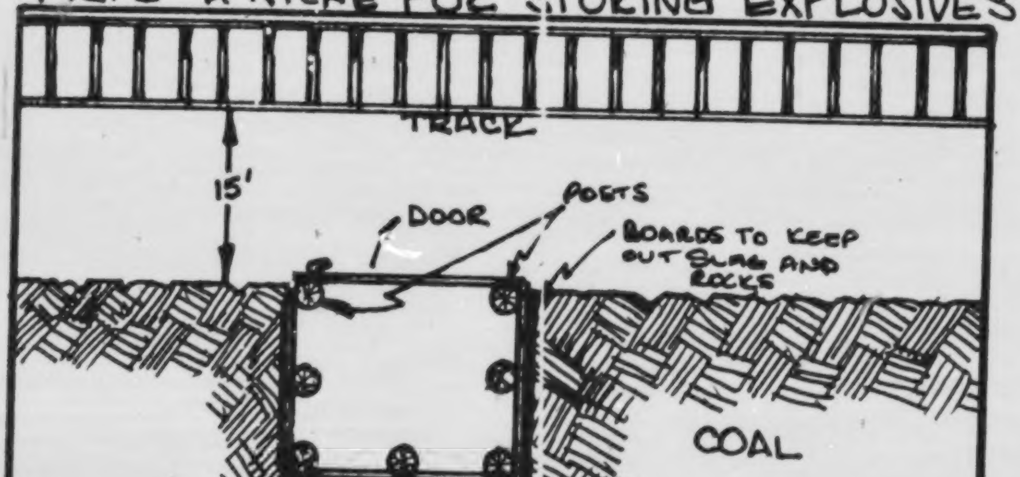


FIG. 1 EXPLOSIVES MAGAZINE FOR TRANSPORTATION & STORAGE

FIG. 2 A NICHE FOR STORING EXPLOSIVES



ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2 STUDENT NAME ______
UNIT 02 MODULE 01 TASK 010 INSTRUCTOR ______
DATE COMPLETED ______ INSTRUCTOR'S INITIALS ______

TASK TITLE: *Proper Manual Lifting Procedures.*

Objective:
Following the class demonstration and the techniques in the information sheet, the student will demonstrate the proper method for manually lifting empty cardboard box to meet the instructor's approval.

Reference:
A class demonstration and discussion.

Tools and Materials:
At least three sizes of empty cardboard boxes.

Procedure:
1. Read the objective at least twice.
2. Participate in the class demonstration and discussion.
3. Study the information sheet and illustrations.
4. Following the demonstration and Safe Lifting Techniques contained in the information sheet, properly lift an empty cardboard box.
5. Check for the instructor's approval.
6. Clean up.

ISSUE 1 DATE 5/24/77 P 1 OF 2

REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. Louis Christoff

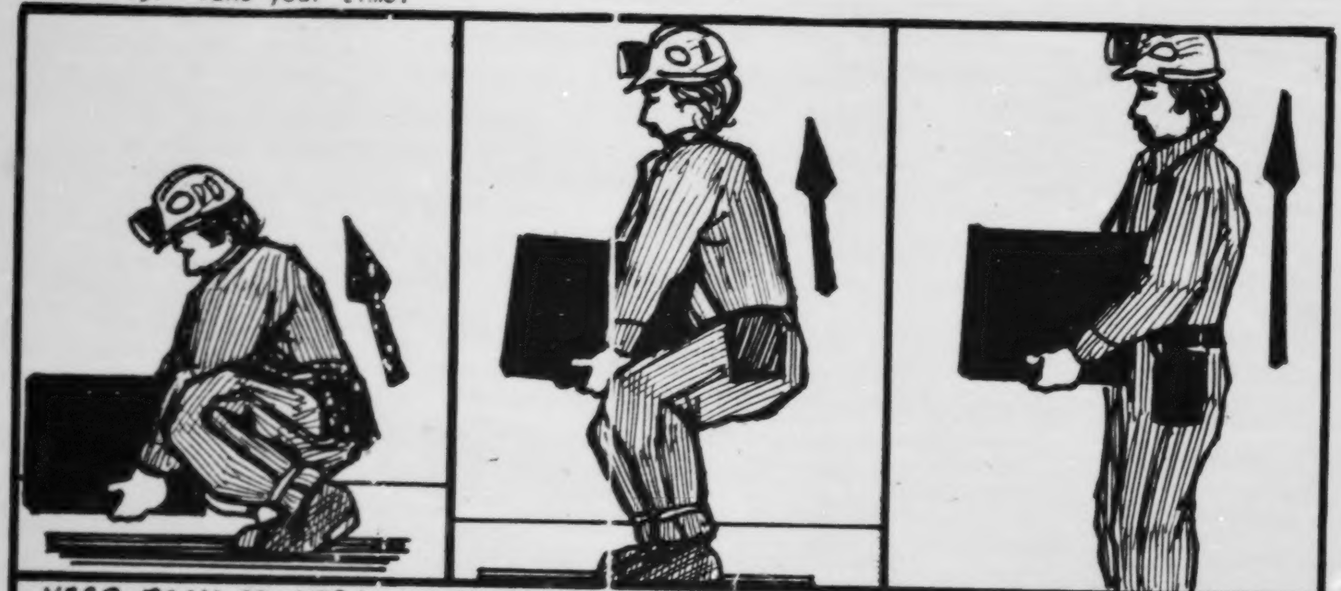
PROGRAM D-2 UNIT NO. 02 MODULE NO. 01 TASK NO. 010

INFORMATION SHEET

Two out of three men in a working force suffer from back problems during their working years. Although diease and illness are major causes of physical injury, improper and heavy manual lifting are also factors which can be avoided.

Safe Lifting Techniques:

1. Place one foot alongside the object and one foot behind it.
2. Keep the back straight, not necessarily vertical, but straight.
3. Tuck in chin. This helps keep the neck straight.
4. Bend at knees.
5. Grip the object with the palm of the hands and not just the fingers.
6. Keep the arms and elbows close to the body.
7. Keep the object close to the body. The body weight should be centered over the feet.
8. Lift straight by straightening the legs.
9. When turning, move the feet, don't twist the torso.
10. Never try to change the position of the object while carrying it or adjust your grip while in motion.
11. Objects to be lifted should be within easy reach to prevent reaching to grasp and pick up the load.
12. Lifting above the waist or shoulder should be avoided to prevent pinching a nerve when arching the back.
13. Take your time.



• KEEP BACK AS STRAIGHT AS POSSIBLE • BEND KNEES • LIFT WITH LEGS, NOT BACK

PROPER METHODS OF LIFTING HEAVY ARTICLES

Before attempting to manual lift any object, the most important move is to check out the load for bulk, weight and size. The other precautions will not help at all if the load is too heavy. If help is needed to handle a large or awkward object, do not hesitate to ask for it. Never attempt to lift an object that is even 1 lb. over your lifting capacity.

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PROGRAM D-2 STUDENT NAME

UNIT 02 MODULE 01 TASK 020 INSTRUCTOR

DATE COMPLETED INSTRUCTOR'S INITIALS

TASK TITLE: *Safe Practices along Track and Belt Haulageways.*

Objective:

After studying the material, the student will identify unsafe practices along track and belt haulageways, by answering all review questions accurately and to the satisfaction of the instructor.

Procedure:

1. Reread the objective.
2. Study the information sheet.
3. Answer the review questions.

Review Questions:

1. What is the major cause of accidents in the mine?

2. What are manholes and where are they located?

3. What may happen if coal gathers under or in the belt rollers?

4. Who may "throw" track switches?

5. When and where may a worker cross a conveyor belt?

ISSUE 1 DATE 6/6/77 P 1 OF 2

REVIEWED & APPROVED RESEARCH MSK. INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. Ronald Bellock

PROGRAM D-2 UNIT NO. 02 MODULE NO. 01 TASK NO. 020

INFORMATION SHEET

The second leading cause of injuries and death in the mine, is accidents that occur along haulageways. (The major cause is roof and rib falls.) The reason for this high rate of injuries is fairly obvious. Track and belt entries contain high powered machinery, equipment traveling at fairly great speeds and powered by high voltage electrical cables.

The following list is only a few of the basic safety practices that should be remembered by all workers. Failure to understand and practice these safety tips may result in a serious accident.

Track Entries:

1. Be sure the mantrip or portal bus is fully stopped before entering.
2. Always enter and leave the mantrip from the side opposite the trolley wire. (clearance side)
3. When riding in an open car, be aware of changes in the roof height. (Low roof sections are marked with reflective tape or lights.)
4. When working along the track, walk on the side opposite from the trolley wire. (clearance side)
5. Keep the track area clean of all debris, rock, coal dust, etc.
6. Be aware of the location of all manholes and use them if necessary. (Manholes are small grooves cut into the rib at 105 foot intervals, large enough for two or three workers and used to escape runaway equipment or other haulageway dangers.)
7. Do not touch the trolley wire with any tools.
8. Before working near a track section, install derailers or wreck switches.
9. Install car blocks when track equipment is parked.
10. No one is permitted to ride on the front of a motor or car, or between cars.
11. Know the location of water lines, fire hose stations and fire cars.
12. Know the signals used by haulage vehicle operators. (Bells, lights, etc.)
13. Do not operate any track equipment unless authorized to do so. (Or in case of an accident.)
14. Do not operate any track switching devices. Equipment operators or trackmen will operate them.

Belt Entries:

1. Know the location of the pull stop line for the conveyor belt.
2. Do not reach into any part of the conveyor system for any reason, while that system is running.
3. When performing clean-up work along the belt, face the same direction as the belt is traveling. (Many accidents are caused by the workers' shovel being accidentally caught in the belt. If facing the wrong direction, the belt might throw the shovel at the worker. If facing properly, a loose shovel will simply be pulled away.)
4. Do not attempt to cross a moving belt.
5. When crossing belts, use the appropriate crossovers.
6. Report any unsafe conditions along the belt, to the beltman or a foreman. (Belt rollers that are not turning, coal buildup on or under belt, etc.)
7. Make sure that all belt rollers are properly lubricated.
8. Know the location of all water lines and fire protection systems.
9. Always walk on the clearance side of the belt.

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EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
STUDENT NAME
UNIT 02 MODULE 01 TASK 030
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *Safe practices along the tram road.*

Objective:

After studying the material, the student will identify unsafe practices along the tram road by answering the review questions accurately and to the satisfaction of the instructor.

Introduction:

Most mines uses trackless operations in the area between the conveyor belt (or loading dock) and the face since this method offers greater speed and the ability to mire difficult veins. This area is referred to as the tram road.

Procedure:

1. Reread the objective.
2. Study the information sheet.
3. Answer the review questions.

Review Questions:

1. What is a tram road?
2. Name several safety practices that should be observed when working on the tram road.
3. Where should the laborer move to avoid an on coming tram vehicle?
4. Who may operate tram equipment?
5. Where do most tram road accidents occur?

ISSUE 1
DATE 2/21/77
P 1 OF 2
REVIEWED & APPROVED
RESEARCH MSK
INSTRUCTOR
ADMINISTRATION
PREPARED BY: Mr. Ronald Bellock

PROGRAM D-2 UNIT NO. 02 MODULE NO. 01 TASK NO. 030

INFORMATION SHEET

Remember the space is limited within the mine. Since tram road vehicles are not confined to a fixed track, the lack of open space increases the movement of the vehicles and the possibility of an accident. Most accidents along the tram road are collisions involving a vehicle and the rib or roof supports. Many workers have been squeezed or crushed against the rib by a moving vehicle.

The following list is some of the tram road safety practices which should be applied and understood by general miners and shuttle car operators. Failure to understand and practice these safety tips may result in a serious accident.

1. At the beginning of each shift, the operator should check the mechanical performance of his vehicle (brakes, lights, steering, warning bells, etc.) and make a trial run along the tram road to notice any changes that may have occurred during the previous shift.
2. The operator should face the same direction as he is traveling.
3. Shuttle cars should not be pushed or bumped by loading machines.
4. When loading, the operator should stay seated and keep control of his car.
5. No one should operate a shuttle car except the qualified operator.
6. No person should ride in the bed of a shuttle car.
7. When following another shuttle car, the operator should maintain a distance of three car lengths between vehicles.
8. The operator should make sure everyone is clear of his machine and should give a warning signal before moving his vehicle.
9. Operators should continuously check the roof and rib conditions and report any unsafe conditions to the face foreman.
10. All trailing cables should be moved to one side of the entry whenever possible.
11. All other power cables should be carefully guarded.
12. Workers should be aware of the location of all tram vehicles and equipment.
13. Because of the high noise level produced by tram vehicles, a system of hand signals should be established and used.
14. Avoid all trailing cables. When a machine with an automatic take-up reel is energized, the reel may snap the cable into the air (like a whip). If hit by this cable, the worker may be seriously injured.
15. Know the location of all emergency equipment (first aid equipment), emergency communications, fire equipment, etc.)

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PROGRAM D-2 STUDENT NAME

UNIT 02 MODULE 01 TASK 040 INSTRUCTOR

DATE COMPLETED INSTRUCTOR'S INITIALS

TASK TITLE: *Safe Practices at the face.*

Objective:
After studying the material, the student will identify unsafe practices at the face by answering the review questions accurately and to the satisfaction of the instructor.

Introduction:
The "face" is the location or wall where the actual process of removing coal is performed. All three methods of underground mining (conventional, continuous and longwall) have a section which is called the face. The coal is removed from the face and transported out of the mine.

Procedure:
1. Reread the objective and introduction.
2. Study the information sheet.
3. Answer the review questions.

Review Questions:
1. When may a worker move beyond the last permanent roof support?

2. Name all of the personal safety equipment a general worker will have at the face.

3. What is the major cause of accidents in the mine?

4. Why must hand signals be used at the face?

ISSUE 1 DATE 6/7/77 P 1 OF 2

REVIEWED & APPROVED RESEARCH MSK INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. Ronald Bellock

PROGRAM D-2 UNIT NO. 02 MODULE NO. 01 TASK NO. 040

INFORMATION SHEET

Most of the workers killed or injured in underground coal mines had jobs which were located near or at the face. (The greatest cause of accidents is roof or rib falls.)

To better understand the dangers that exist at the face, consider the conditions. Since the face is the newest section of the mine and constantly advancing, it if often poorly lighted and only a minimum of roof support can be set. The face is also quite crowded. (There is not much room for all of the equipment, machines and men which must be working in this section.) The noise and dust levels of the face area are very high.

To make the face section more safe, all workers should understand and practice each of the following list of safety tips.

1. Workers should check all personal safety equipment and clothing to be sure of proper fit and protection (hard hat, lamp, self rescuer, leg bands, safety glasses, etc.).
2. Learn and use a set of hand signals for work at the face.
3. Avoid all working machinery as much as possible.
4. Test the roof often.
5. Never go beyond the last permanent roof support except for the purpose of setting roof supports.
6. Always begin setting roof supports near the last permanent roof support and work toward the face. (Never begin at the face and work back.)
7. Keep all trailing cables to the side of the entry and out of mine water.
8. Keep the runway or tram road clean of all debris or rock.
9. Be aware of the location and movement of all working equipment.
10. Machine operators can rarely see beside their machine. If you are on the side opposite the operator, stay away from the machine.
11. Be aware of all signals (bells, lights, etc.).
12. Know the escapeway.
13. Follow the instructions given on all warning signs or tags.
14. Listen to the advice of experienced workers.
15. Keep all tools out of the way of moving equipment.
16. Know the location of all emergency equipment, (including communications, first aid equipment, fire equipment and electrical power supplies).
17. Report any unsafe conditions to the foreman, immediately.
18. Use your respirator,

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PROGRAM D-2 STUDENT NAME ____

UNIT 02 MODULE 01 TASK 050 INSTRUCTOR ____

DATE COMPLETED ____ INSTRUCTOR'S INITIALS ____

TASK TITLE: *Classification of Mine Fires.*

Objective:

After studying the information sheet, the student will list the classes of mine fires and what types of fire extinguishers are used with each and answer all review questions correctly.

Procedure:

1. Read the objective at least twice.
2. Study the information sheet.
3. Answer all review questions.

Review Questions:

1. According to the National Fire Protection Association, how are fires classified?

2. List the four classes of fires, their origin, and what types of fire extinguishers are used with each.

3. What should be done if a fire can no longer be fought directly and foaming machines are ineffective?

ISSUE 1 DATE 4/21/77 P 1 OF 3

REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. Michael Most

PROGRAM D-2 UNIT NO. 02 MODULE NO. 01 TASK NO. 050

INFORMATION SHEET

The National Fire Protection Association classifies fires as A, B, C and D, according to their origin.

Class A

Class A fires are started from combustible solids such as wood, pyritic ore, coal, cloth, rubber, plastic and paper.

The most common extinguishing agent for Class A fires is water which cools and quenches. Soda-acid, carbon dioxide and chemical form are also good extinguishers.

Class B

Class B fires are started from flammable liquids such as oil, grease, gasoline, hydraulic oil, diesel fuel and brake fluid. Class B liquid spill fires commonly occur when flammable or combustible liquids collect under shuttle cars, cutters, face and roof drills, loading machines, continuous miners, car spotters and accidental spillage.

A smothering effect, such as is accomplished with chemical foam, vaporizing liquids, carbon dioxide and water fog is needed to extinguish Class B fires.

Class C

Class C fires are started from electrical equipment such as electrical motors, trailing cables, trolley wires, battery equipment, transformers, junction boxes, and switch panels.

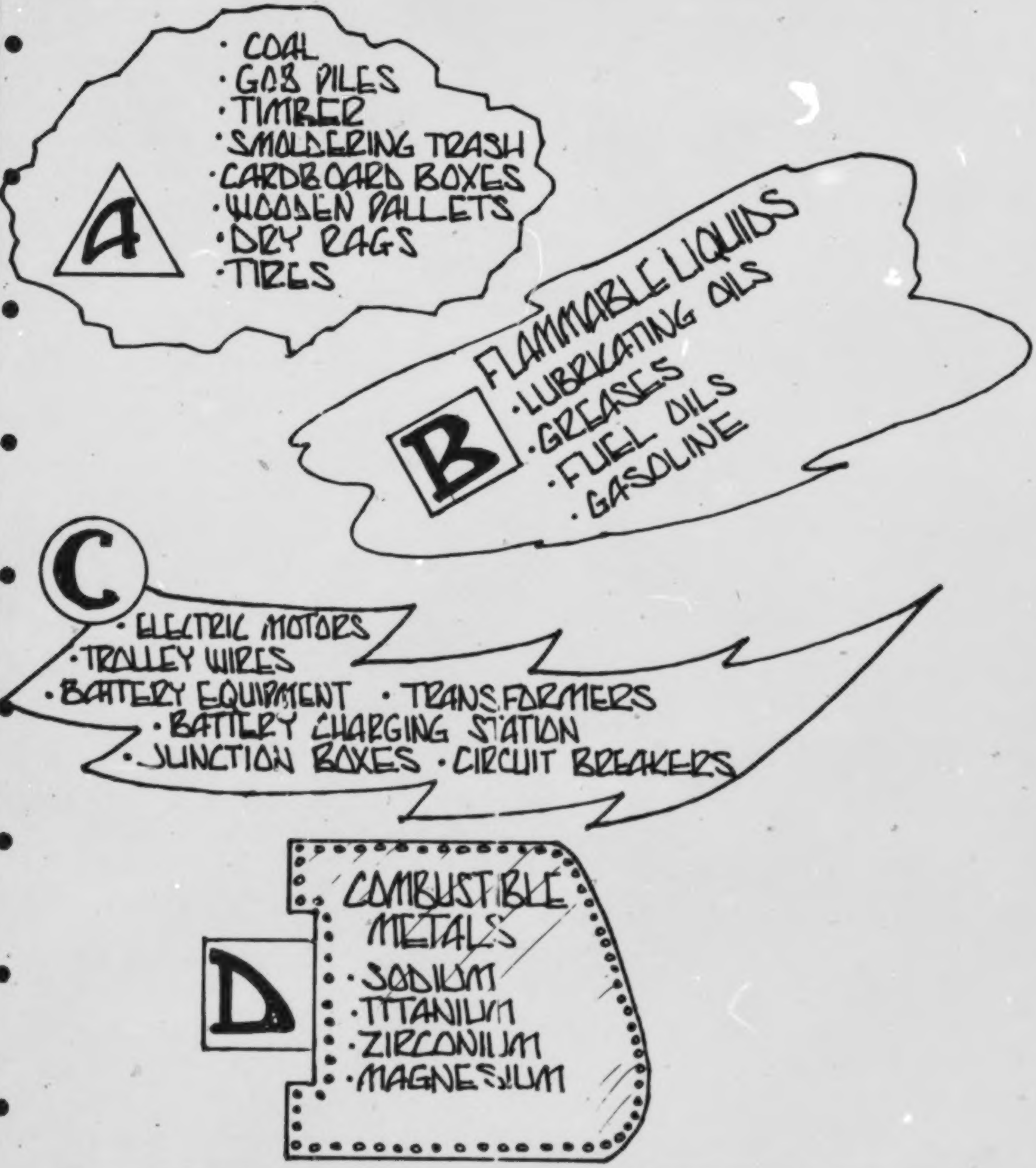
For attack of a electrical fire, the power source must always be disconnected immediately. Nonconducting extinguishing agents, such as dry chemical and vaporizing liquids, must be used.

Class D

Class D fires are started from combustible metals such as magnesium, aluminum, phosphorous, zirconium and sodium.

Special methods, extinguishing agents and equipment have been developed to control and extinguish Class D fires. Usually normal extinguishing agents will cause a chemical reaction between the agents and the burning metal.

Most mining companies use the A, B and C classification of fires. High-expansion foam and integral fire suppression system are recent affective aids. In the case where a fire can not be fought directly and foaming machines are ineffective or not available, the fire area should be sealed off.


A
· COAL
· GOB PILES
· TIMBER
· SMOLDERING TRASH
· CARDBOARD BOXES
· WOODEN PALLETS
· DRY RAGS
· TIRES
B
FLAMMABLE LIQUIDS
· LUBRICATING OILS
· GREASES
· FUEL OILS
· GASOLINE
C
· ELECTRIC MOTORS
· TROLLEY WIRES
· BATTERY EQUIPMENT
· TRANSFORMERS
· BATTERY CHARGING STATION
· JUNCTION BOXES
· CIRCUIT BREAKERS
D
COMBUSTIBLE METALS
· SODIUM
· TITANIUM
· ZIRCONIUM
· MAGNESIUM

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
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PROGRAM D-2
UNIT 02 MODULE 01 TASK 06
DATE COMPLETED
STUDENT NAME
INSTRUCTOR
INSTRUCTOR'S INITIALS

TASK TITLE: *Causes, Prevention and Hazards of Mine Fires.*

Objective:

After reading the information sheet, the student will answer all review questions to 90% accuracy.

Procedure:

1. Read the objective several times.
2. Study the information sheet.
3. Answer all review questions.

Review Questions:

1. Name the three basic elements needed to cause a fire.

2. Name some sources of ignition for mine fires.

3. What is the main source of ignition and why?

4. Why is a good ventilation system an important fire preventative?

5. - 9. List at least five federal laws set up for fire precaution.

10. Briefly discuss the great need for fire precaution from an economic point of view.

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REVIEWED & APPROVED
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INSTRUCTOR
ADMINISTRATION
PREPARED BY: Mr. Wayne Farabaugh

PROGRAM D-2 UNIT NO. 02 MODULE NO. 01 TASK NO. 060

INFORMATION SHEET

Causes of Mine Fires

The three elements needed to cause a fire are fuel, a source of oxygen such as air, and heat which will start the fuel burning. Coal mines, which contain timber, lubricating materials, oily shale and of course coal, are made from fuel for fires. Methane gas and coal dust are also sources of ignition. Coal mines are more likely to have fires and explosions than other types of mines.

The general source of ignition for mine fires are open flames such as: flame lights, matches, electricity and explosives. The main source of mine fires is electricity. (With the ever increasing use of electrical equipment, this can be expected.) Since the elimination of black powder and other longflame, explosives for blasting, explosives are no longer a major threat. Conveyor belts and other equipment which may cause friction should be well greased and maintained to eliminate another source of ignition. Slippage and sequence switches on the belt conveyors are fire prevention devices designed to shut off power to eliminate heat buildup. (75.1102)

Among the other causes of mine fires include methane face ignitions, frictional sparks from cutting bits, mishandling of flame safety lamp, improperly ventilated battery chargers and power centers and spontaneous combustion, to name a few.

Fire & Explosion Prevention

Probably the best fire and explosion prevention is good ventilation system. By maintaining 9,000 cubic feet of air per minute at the last open crosscut and 3,000 CFM at the face, dangerous gases and dust are diluted and carried away. Rock dusting and methane testing are also prevent measures.

The federal law prevents fires by trying to eliminate the source of fire and explosion material. No open lights and no smokers' articles such as cigarettes, cigars, pipes or matches are permitted in coal mines. (This is a federal offense.) Good housekeeping and maintenance of hydraulic lines in all equipment are other preventive measures. All mining machines using flammable fluids must have fire suppression system on them, and lubricating oil and grease must be kept in fireproof metal containers and stored in a fireproof place.

Automatic detecting and warning systems (such as the Audio Visual Alarm System) and fire extinguishing systems (such as the Deluge System) are required near all belts. (75.1101) All belts must be made from flame-resistant material. (75.1108)

Only those explosives without a long flame are premitted to be used for blasting. Drill holes for explosives must be a tamped with a noncombustible material, such as rock dust, to prevent fires when shooting into the solid coal.

Transformer stations, battery chargers, electrical substations, compressors, shops, permanent pumps and such must be contained in fireproof housings.

PROGRAM D-2 UNIT NO. 02 MODULE NO. 01 TASK NO. 060

Hazards of Mine Fires

One of the major hazards of the coal industry is mine fires, not only because of the immediate damage but also because of the possible loss of human lives and the economic loss through fire damage and production.

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PROGRAM D-2
STUDENT NAME
UNIT 02 MODULE 01 TASK 070
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *Respirable Dust.*

Objective:

After studying the material, the student will explain the dangers of respirable dust, the precautions taken to prevent it and the laws concerning dust regulation to the satisfaction of the instructor by answering all the review questions accurately.

Introduction:

There are many different types of dust (coal dust, rock dust, etc.) produced within a mine. All mine dusts are placed in one of two general categories: respirable and non-respirable dust. Respirable dust includes only dust that can be breathed into the lungs. For example, only dust particles that are 40 microns or larger in size can be seen. However, only dust particles that are 5 microns or smaller can be breathed into the lungs since all larger particles are trapped in the nose or throat. These particles are respirable dust.

Procedure:

1. Read the objective twice.
2. Study the information sheet.
3. Answer all review questions.

Review Questions:

1. What is respirable dust?
2. Why is respirable dust dangerous?
3. What precautions are taken to limit the amount of respirable dust in the mine?
4. How is the sampling of respirable dust done?
5. What is the allowed amount of respirable dust near the face?

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DATE 2/16/77
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REVIEWED & APPROVED
RESEARCH MSK
INSTRUCTOR
ADMINISTRATION
PREPARED BY: Mr. Ronald Bellock

PROGRAM D-2 UNIT NO. 02 MODULE NO. 01 TASK NO. 070

INFORMATION SHEET

The presence of respirable dust in a mine is a serious health hazard to mine workers. Coal dust breathed into the lungs may result in pneumoconiosis (black lung). Therefore, careful precautions are taken to limit the amount of dust in the mine and to limit the amount of dust inhaled by the worker. For example, most continuous miners spray a pressurized mist of water while operating to limit the amount of free-floating dust produced by the miner. Also dust respirators are available to miners working in sections with a high level of respirable dust.

However, the most important precaution involves the sampling of respirable dust. The methods of sampling and the laws regarding it are very complicated and only the basic regulations will be mentioned.

Sampling is done with the aid of a vacuum type sampler worn by the worker. (See illustration) Using this method the sampler will draw the same amount of respirable dust as the worker's lungs will inhale and hold. (The worker should not tamper with the unit since it may cause the sample to be incorrect.)

The sampler must be worn for a complete shift. When beginning a new section of the mine, samples must be taken for ten straight days by the mine operator (Day shift operator only). If less than 60% of the average tonnage is mined during that shift, the sample, can't be used and another sample must be taken.

The results of these samples must show an average sample of less than 2 milligrams of respirable dust to comply with federal standards. After these ten samples, the miner operator must sample the respirable dust five times during every two months. (While still maintaining at least 60% of the average tonnage.)

Samples must also be taken by non-face workers (one sample every three months) and outside workers (once a year). However, outside samples must be lower than one milligram per cubic meter to comply with federal standards.

The laws concerning the amount of respirable dust are extremely strict. Failure to comply with federal laws concerning respirable dust may result in a fine or the closing of the mine section that does not comply. However, these laws (70.200) are designed to help improve the health and working conditions of the worker and should be carefully observed.

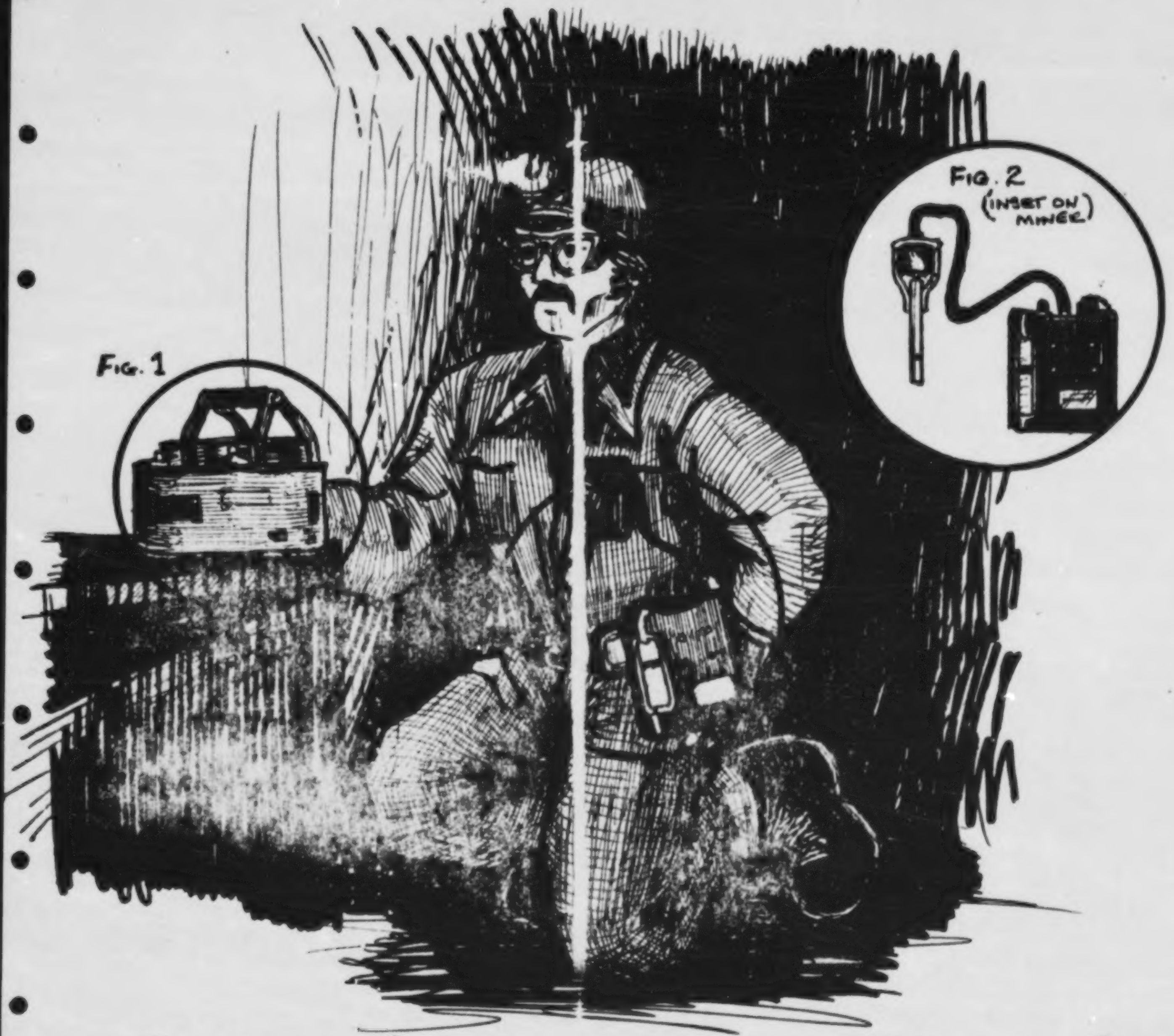
Fig. 1
Fig. 2
(inset on miner)

Fig. 1 Mines Research Establishment Gravimetric Sample

Fig. 2 U.S. Atomic Energy Commission Personal Sampler

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PROGRAM D-2

STUDENT NAME

UNIT 02 MODULE 01 TASK 080

INSTRUCTOR

DATE COMPLETED

INSTRUCTOR'S INITIALS

TASK TITLE: *Rock Dust.*

Objective:
After studying the material, the student will explain the purpose, methods and federal standards of rock dusting to the satisfaction of the instructor by answering all review questions correctly.

Introduction
Since rock dusting is one of the most common safety precautions used in the mining industry, a general knowledge of its uses will be required of the student.

Procedure:
1. Reread the objective.
2. Study the information sheet
3. Answer all review questions

Review Questions:
1. What is rock dust?
2. What is the most common form of rock dust?
3. Why is rock dusting considered an important safety precaution?
4. How much of the mine must be dusted?

ISSUE 1

DATE 3/22/77

P 1 OF 5

REVIEWED & APPROVED

RESEARCH

INSTRUCTOR

ADMINISTRATION

PREPARED BY: Mr. Ronald Belock

PROGRAM D-2 UNIT NO. 02 MODULE NO. 01 TASK NO. 080

INFORMATION SHEET

Rock dust is simply an incombustible (non-burning) dust sprayed or applied to the roof, rib and bottom of the mine.

The most common form of rock dust is crushed limestone, however, any substance that will stay a non-burning, dry dust is acceptable if approved by federal standards. Since light colored dusts are preferred (so that dusted areas can be easily recognized), a well rock-dusted mine will appear gray, brown or white depending on the type of dust used and its age.

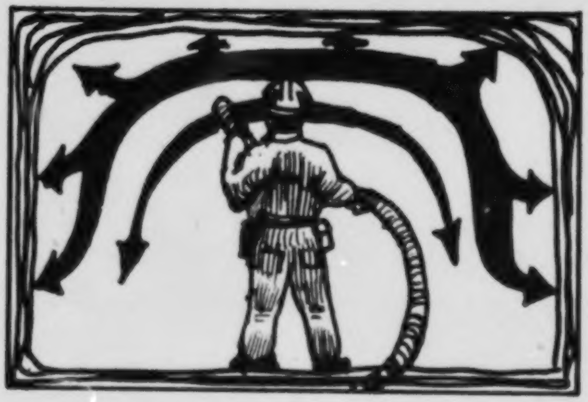
When used in the proper quantity, rock dust will stick to the roof, ribs and bottom of the mine and offset the explosive nature of coal dust. For this reason, rock dusting is one of the most common safety precautions in the mine. Since rock dust is basically non-burning, it will help prevent mine fires and explosions by covering all the burnable materials (especially coal dust).

Methods of applying rock dust vary with the mine and the conditions inside. Many methods are available to the industry, but generally, rock dust is applied by hand or by some type of blower or fan.

Mechanical dusters are desirable since they can dust large areas in a short time. Most dusters are mounted on rubber tires or rail wheels to provide mobility. (See fig. #1) Other dusters are designed to be mounted on face equipment. (Shuttle cars, roof bolters, etc.) (See fig. #2)

Before the end of each shift, all areas regularly travelled by equipment should be re-dusted. The face area should be dusted at the same time. This dusting is usually delivered to the section, opened and scattered by hand or with shovels. This dust should be thrown toward the roof or rib. All excess dust will fall and cover the bottom. (See fig. #3) However, this method does not cover the section well and must be rock-dusted again using a blower. (This is usually done on idle days or after a section has been finished or "worked out".) All tram road areas should be done at the end of each coal-producing shift to recover the floor since the previous rock dust has been shifted by moving shuttle cars.

Since rock dusting has been very successful as a safety feature, federal law (75.402) has established strict guidelines for dusting. All mines (except those mines designated within the law) in the coal industry must dust all sections of the mine to a distance of no more than forty feet from the face. Samples of rock dust must be taken every two months by the mine supervisor or other authorized personnel. Samples must be collected every 2000 feet along the main heading and every 500 feet on all other cuts. Dust samples taken from all air intake sections must be at least 65% non-burning and samples from return sections must be at least 80% incombustible. If samples do not comply, the area must be dusted again.



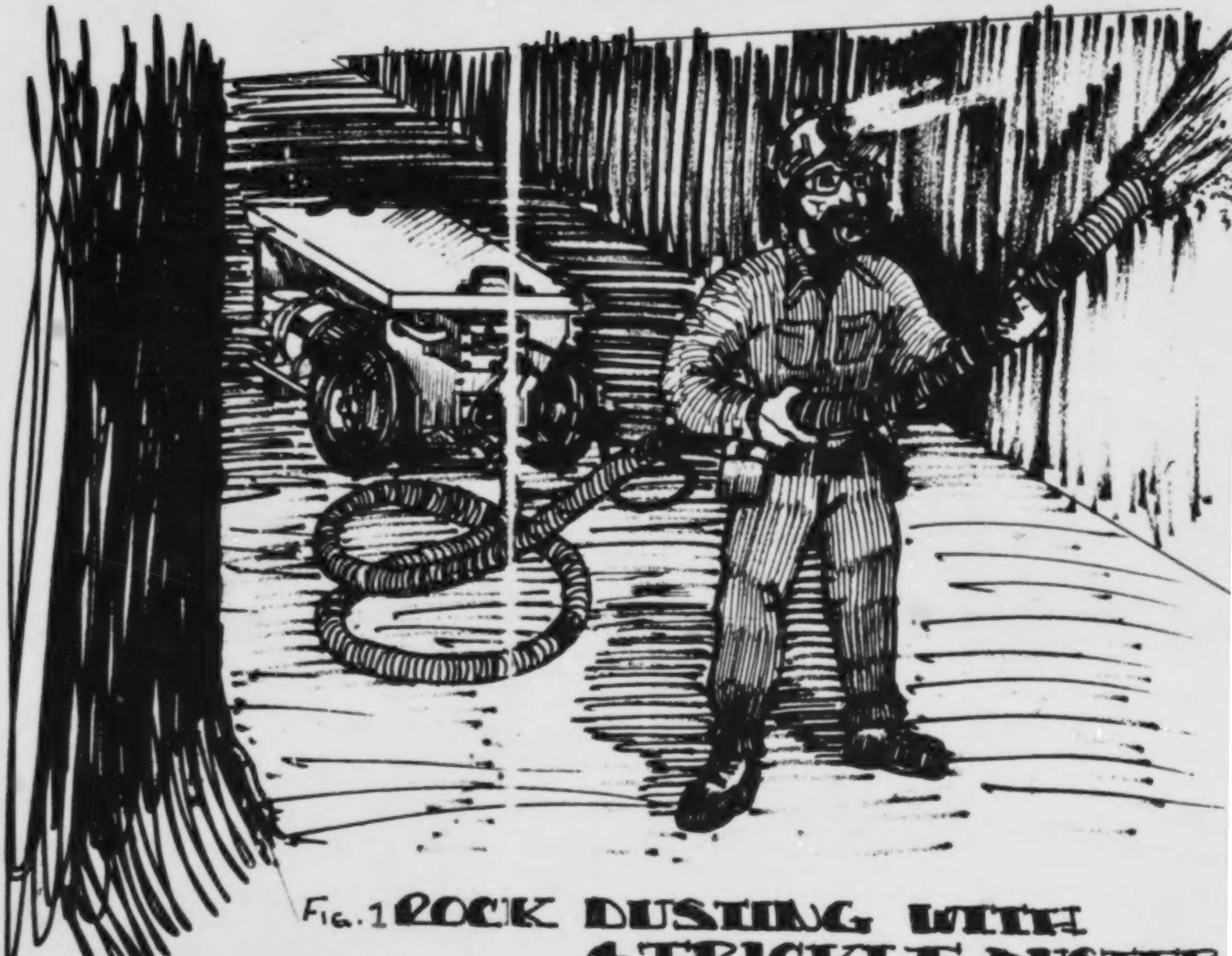


Fig. 1 ROCK DUSTING WITH A TRICKLE DUSTER

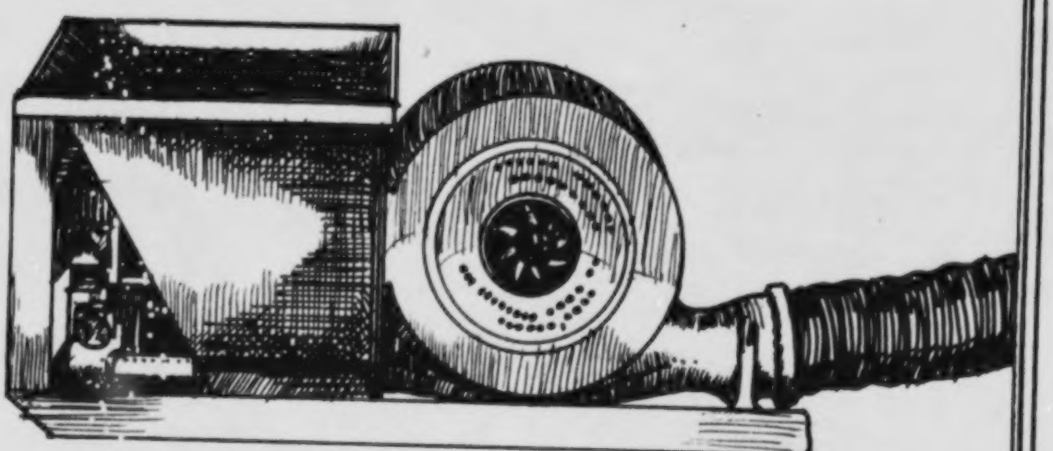


Fig. 2 PORTABLE ROCK DUSTER

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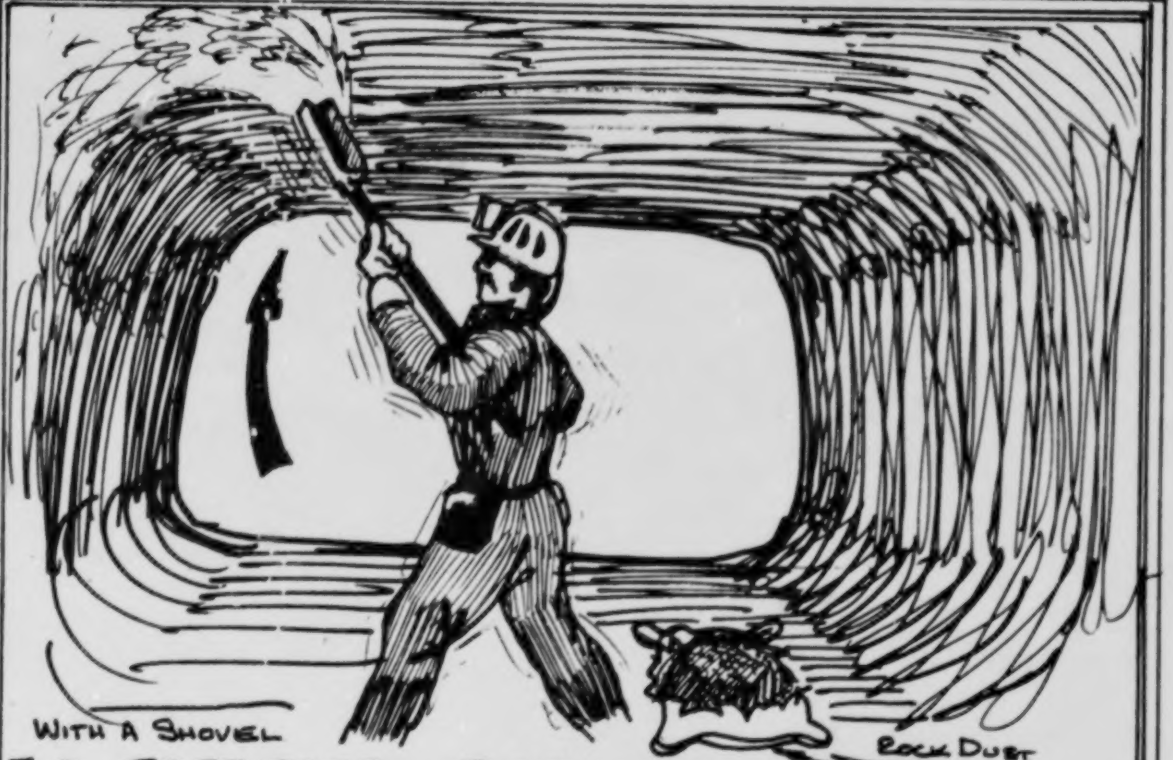
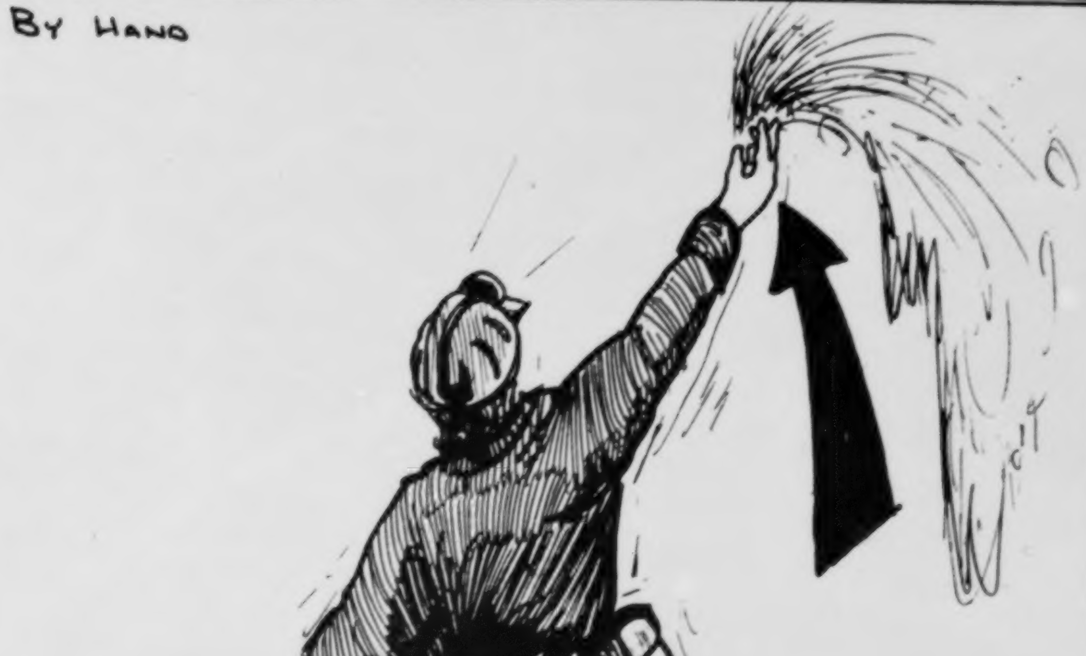

WITH A SHOVEL
ROCK DUST

FIG 3. MANUAL ROCK DUSTING



ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
UNIT 02 MODULE 02 TASK 010
DATE COMPLETED ________

STUDENT NAME ________
INSTRUCTOR ________
INSTRUCTOR'S INITIALS ________

TASK TITLE: *Proper Method of Riding In A Mantrip.*

Objective:

After reading the information sheet, the student will show a knowledge of the proper procedures for riding a mantrip by answering all review questions to 90% accuracy.

Procedure:

1. Read the objective several times.
2. Study the information sheet and illustrations.
3. Answer all review questions.

Review Questions:

1. Explain the purpose of a mantrip.

2. Define: portal bus.

3. Who is required to wear safety goggles and under what conditions? Explain why.

4. What must been done before starting each mantrip?

5. Briefly explain the procedures to follow while riding in a mantrip.

6. What is the distance required between each moving mantrip?

7. Are explosives permitted to be hauled on mantrips?

8. Are tools permitted to be hauled on mantrips?

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REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION
PREPARED BY: Mr. Louis Christoff

9. Who is in charge of the mantrip?

10. What is the maximum number of men permitted on one mantrip?

INFORMATION SHEET

The purpose of a mantrip is to transport miners from the portal to the working area by means of a portal bus. A portal bus, a car consisting of three compartments, runs on a trolley wire and can hold a total of 12 men, including the operator. The operator must be an experienced senior miner who is familiar with the mine and its conditions and the haulage safety rules and regulations. If the bus is not equipped with a plexiglass windshield in front and is of the "open-type", the operator and front compartment passengers are required by federal law to wear safety glasses, and it is recommended that the other passengers have eye protection as well. (75.1403-7)

Before starting any mantrip, the face boss and operator must thoroughly check the portal bus to make sure it contains sand, a fire extinguisher, the first aid box, jack and jack handle. The lights and nip of the trolley pole must also be checked to make sure they work properly.

After the safety chains are hooked on each compartmemt and the trolley pole is taken from the catch and placed against the trolley wire, the operator signals with the bell that the bus will move out.

Mantrips should not be operated within 300 feet of any trip, including another mantrip. All trips should be operated at speeds according to the conditions and the equipment used and should be so controlled that they can be stopped within the limits of visibility. No passengers should be permitted to get on or off a moving mantrip. For no reason should arms and other limbs be outside the compartment while it is moving.

Once the mantrip has reached its destination, the operator must make sure the break is secure before replacing the trolley pole in the catch provided. Wait until the boss signals that the bus is at a complete stop before releasing the chain and unloading. At places where men enter or leave mantrips, federal law requires ample clearance and provisions to prevent persons from coming in contact with energized electric circuits. (75.1403-7L)

Except for small hand tools, supplies or tools are not permitted to be transported with men. Also, explosives and detonators are not permitted on mantrips or hauled within 5 minutes before and after any mantrip.

The legal speed of a man-trip is not more than 6 miles an hour or as designated by the mine foreman.

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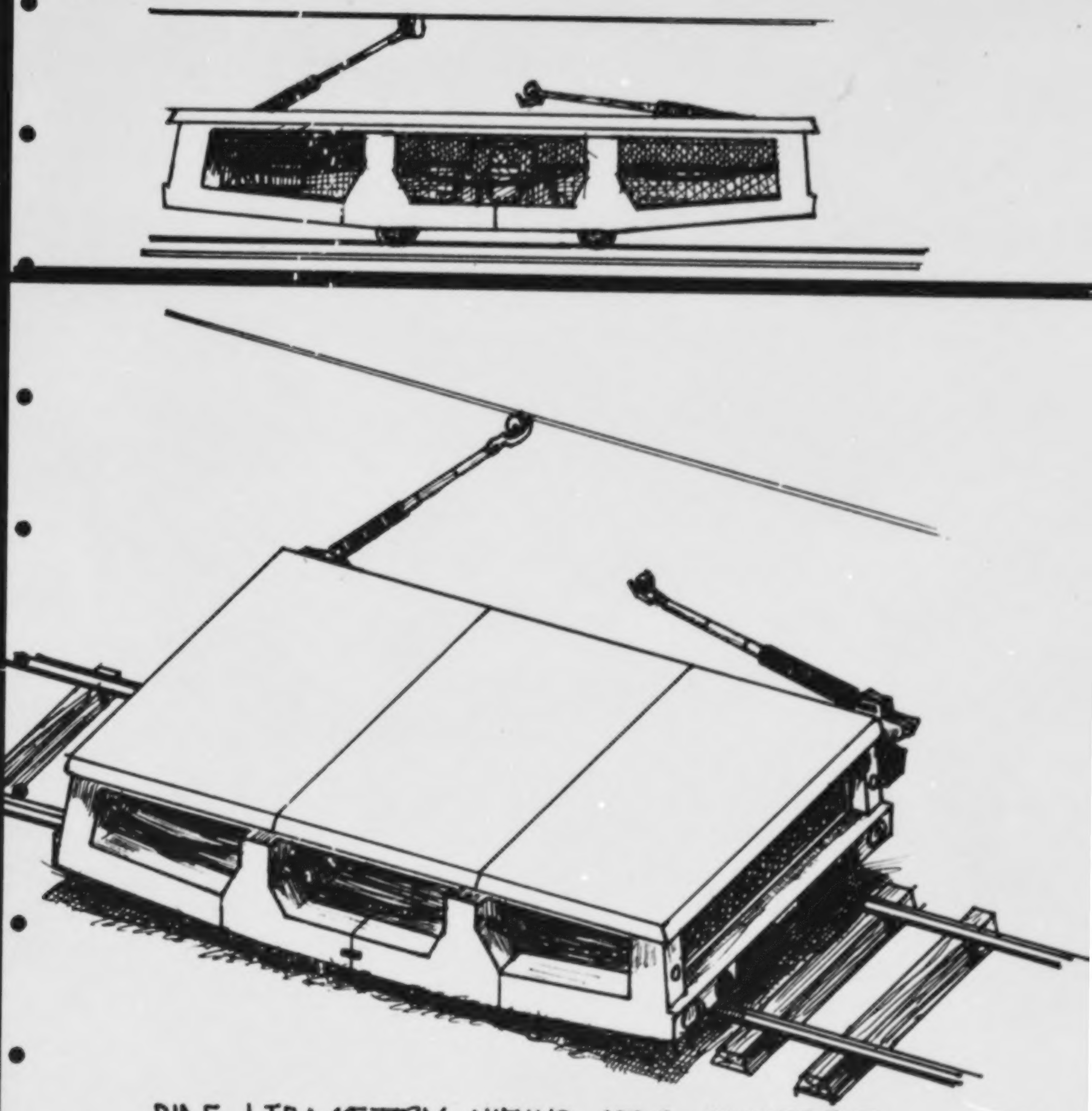

SIDE & ISOMETRIC VIEWS OF A MANTRIP

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
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PROGRAM D-2

STUDENT NAME

UNIT 02 MODULE 02 TASK 020

INSTRUCTOR

DATE COMPLETED

INSTRUCTOR'S INITIALS

TASK TITLE: *Proper Procedures for Crossing over and Riding Belts.*

Objective:

After studying the information sheet, the student will briefly explain the proper procedures for crossing over and riding conveyor belts by answering review questions to 90% accuracy.

Procedure:

1. Read the objective several times.
2. Study the information sheet and the illustrations.
3. Answer all review questions.

Review Questions:

1. Briefly explain the proper procedures for crossing over conveyor belts.

2. Briefly explain the proper procedures for riding a conveyor belt.

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RESEARCH

INSTRUCTOR

ADMINISTRATION

PREPARED BY: Mr. Louis Christoff

PROGRAM D-2 UNIT NO. 02 MODULE NO. 02 TASK NO. 020

INFORMATION SHEET

Proper Procedure for Crossing Over Belts

According to Federal law 75.1403-5j, persons should not cross moving belt conveyors, except where suitable crossing facilities are provided. Bridges, as shown in fig. 1, are located about 18" off the belt at belt drives and other convenient locations for crossing the moving belt. Never attempt --- to cross a moving belt! If it becomes necessary to cross at a location without a bridge, pull the stop cord (sometimes referred to as the Jabco) and stop the moving belt before crossing. In this case, since the Jabco is located on one side only, someone will have to start the belt again by pulling the cord from that side. Never reach across the belt and pull the Jabco to start it again.

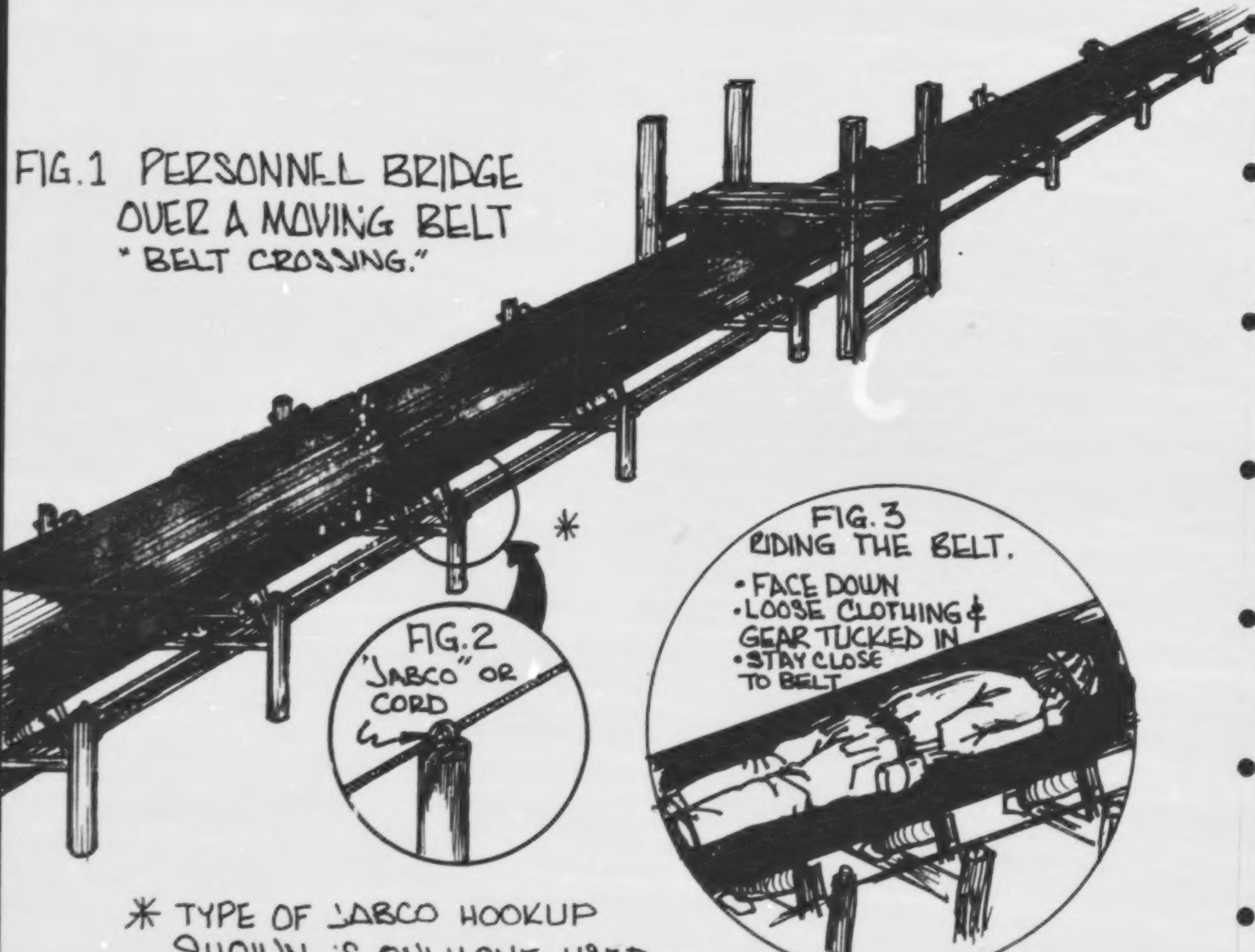

FIG.1 PERSONNEL BRIDGE OVER A MOVING BELT "BELT CROSSING."

FIG.2 "JABCO" OR CORD

FIG.3 RIDING THE BELT.
- FACE DOWN
- LOOSE CLOTHING & GEAR TUCKED IN
- STAY CLOSE TO BELT

* TYPE OF JABCO HOOKUP SHOWN IS ONLY ONE USED... CAN ALSO BE HUNG FROM PROPS.

PROGRAM D-2 UNIT NO. 02 MODULE NO. 02 TASK NO. 020

Proper Procedures for Riding A Belt

Many mines prohibit the riding of belts because of the danger involved, and those that do are required to follow strict federal laws (75.1403-5). Stop cards must be readily accessible along the belt so the belt can be stopped or started at any location. Belt conveyors must be cleared and completely stopped while men are loading or unloading and the transporting speed should not exceed 300' per minute when the vertical clearance is 18" and minimum side clearance is 36" where men board or leave. A clear travelway of 24" wide should be provided on both sides of all belt conveyors. Colored lights or reflective signs and telephones should be installed at loading and unloading stations.

Never attempt to load or unload until the belt conveyor is at a dead stop. When loading, position yourself face down, making sure loose gear and clothing is tucked in under the body. Keep the head against the belt. Do not raise it. See Fig. #3. Do not ride through air-locks. Instead, stop the belt by pulling the stop cord, crawl through and, after tucking loose gear in, continue the trip by pulling the cord. When transporting more than one miner, load at intervals.

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PROGRAM D-2
STUDENT NAME
UNIT 02 MODULE 02 TASK 030
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *Energize and De-energize Track Equipment.*

Objective:

After studying the material, the student will explain the basic methods of starting and stopping track equipment by answering the review questions to 100% accuracy and to the satisfaction of the instructor.

Introduction:

General workers are not permitted to operate equipment under normal conditions. However, in an emergency situation, it may be necessary that the worker be able to operate the basic functions of that machine. This task sheet will discuss, only the basic principles and controls of some track equipment.

Procedure:

1. Reread the objective.
2. Read the introduction.
3. Study the information sheet and illustrations.
4. Answer the review questions.

Review Questions:

1. Under normal conditions, who may operate track equipment?

2. If any track equipment, is arcing or producing sparks, what is the first step in removing the power from that machine?

3. What type of brakes are found on all track equipment?

4. Why must the wheels continue turning when sand is being released onto the tracks?

5. How may a trolley pole be removed from the trolley line?

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INSTRUCTOR
ADMINISTRATION
PREPARED BY: Mr. Michael Most

PROGRAM D-2 UNIT NO. 02 MODULE NO. 02 TASK NO. 030

INFORMATION SHEET

There are three basic types of track equipment: portal buses (mantrips), jeeps and motors (locomotives). Operators for these machines are trained for that purpose and no other person should operate this machine. However, in an emergency situation, it may be necessary for the general worker to operate the equipment brakes, and remove the power supply from contact with the machines.

All track equipment is powered by the trolley line. Direct contact with the trolley line is necessary to power the equipment. This contact is made by a trolley pole (See Fig. #1), that extends from the machine to the trolley line. This pole is well insulated by a wood covering and may be touched by the worker. Since the trolley pole is spring loaded, the pole may be pulled down and direct contact with the trolley line is broken. This action will immediately remove the power from the machine and stop the motors, within the machine. However, if the machine is not properly braked and blocked, this action will permit the machine to freely roll down the tracks

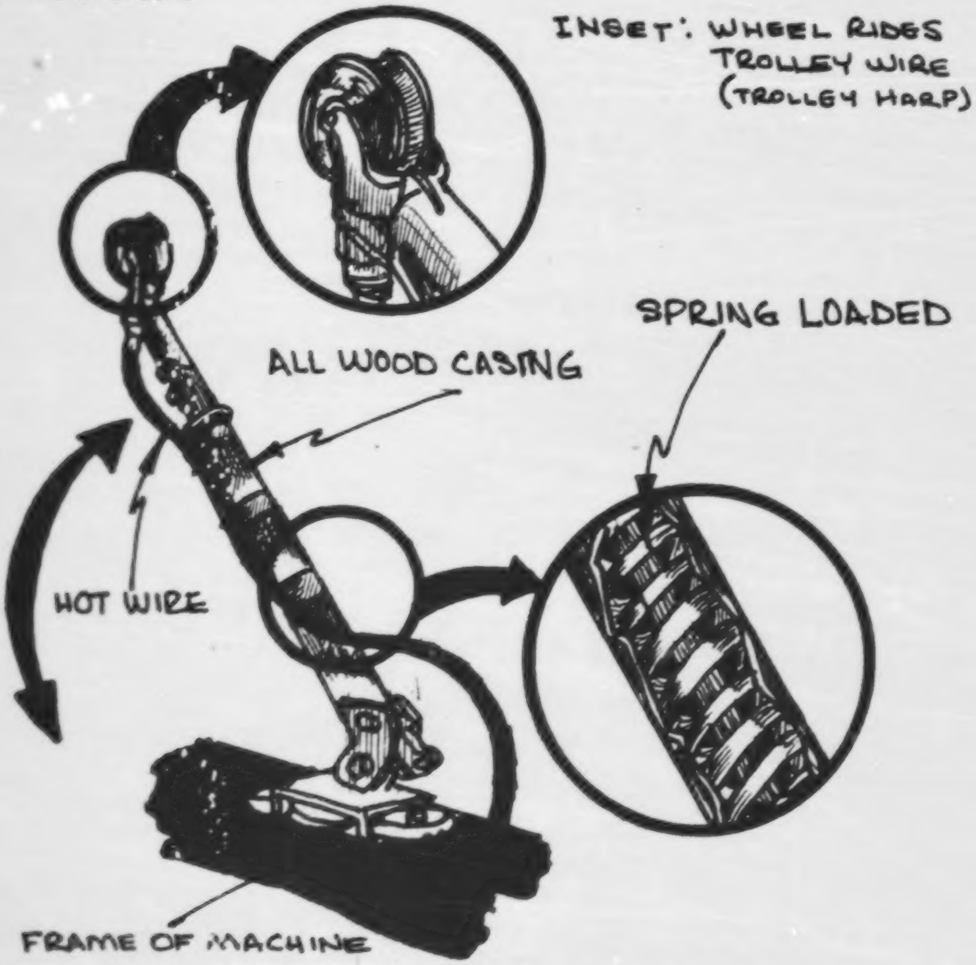


FIG. 1 TROLLEY POLE & INSET OF HARP

If it becomes necessary for a general worker to stop the motion of a machine, the worker should be aware of the machine's braking system. A variety of braking systems are available on track equipment and the worker should be aware of the type found on that particular machine. However, there are four basic types of braking systems: hydraulic (fluid brakes), pneumatic (air brakes), dynamic (electrical) and mechanical or manual. Federal law (75.1404) requires that mechanical or manual brakes be found on all track equipment as well as one of the other types.

Hydraulic and pneumatic brakes are usually the lever type or the wheel brake, (See fig. #2) and may be found on one side of the operator. (In a covered portal bus, this brake may be found above the operator's head.)

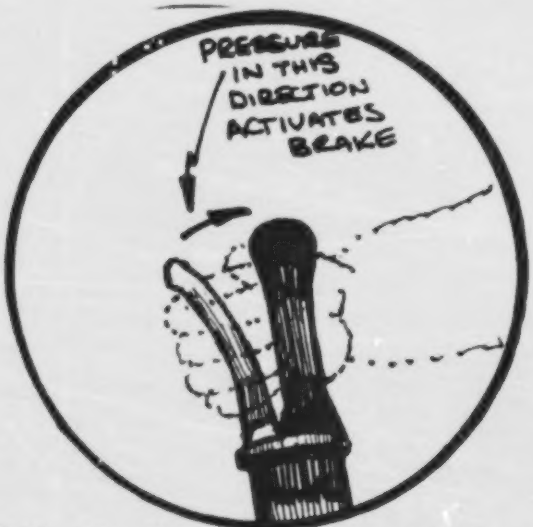

PRESSURE IN THIS DIRECTION ACTIVATES BRAKE

FIG. 2 CLOSE-UP OF HANDBRAKE

Dynamic brakes are only used in slowing the vehicle, and will not bring the vehicle to a complete stop. Using dynamic brakes is much the same as "down-shifting" an automobile. After locating the controller (which is directly in front of the operator's seat, on a locomotive and jeep) the worker need only turn the controller slowly (one direction only) which will slow the engine speed and the locomotive.

Mechanical or manual brakes are one of two types: the wheel or the ratchet handbrake. These are operated by hand in the following manner:

Wheel brake:

1. Locate the wheel brake at the side of the operator's seat.
2. Slowly turn the wheel (clockwise) until the brakes begin to slow the vehicle. (Do not quickly turn the wheel since this may cause the brakes to lock and the vehicle will slide - "out of control".)

Ratchet hand brake:

1. Locate the hand brake. (Usually found in front of the operator's seat and between his legs.)

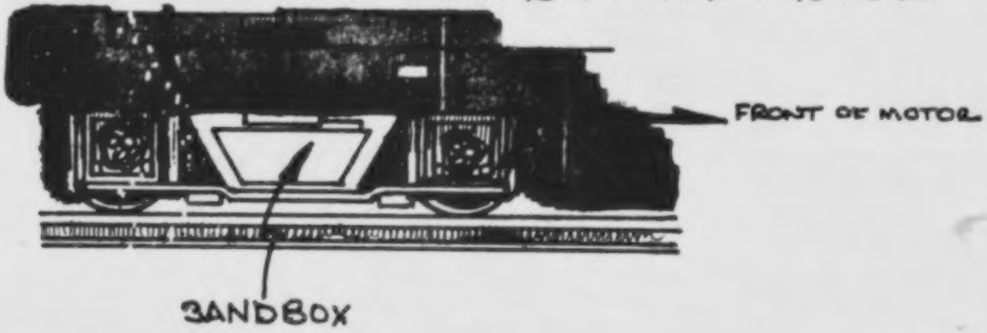
2. Pull the handle toward the operator's seat.
3. Push the handle back to it's orginal position and repeat this motion (back and forth) until the brakes tighten enough to stop the vehicle.

Sand Boxes

When the tracks are wet or icy, it is difficult to safely stop the machine. Applying the brakes may cause the machine wheels to stop turning and the machine will slide like a sled on ice. For this reason, sand feeders (boxes) are located on all track machinery near the wheels. If sand is dropped onto the track in front at the wheels and the wheels are still turning, the sand will assist the traction and the machine will stay "in control" while slowing. (However, if the wheels are "locked" in place by braking too quickly, the wheels will simply push the sand off the track and the machine will continue sliding. It is best to drop sand while slowing the speed of the turning wheels.) (See fig. #3)

To operate these sand boxes, the worker should locate a small lever, cord or push button near the operators seat and activate the sand boxes with this lever, cord or button. Then the worker may slowly operate the brakes and safely stop the machine. (Blocks should be placed in front of the wheel, to prevent the machine from drifting, once it has been stopped.)

FIG. 3 LOCATION OF A SANDBOX ON A MOTOR



A large variety of track equipment is manufactured, today. The control and braking systems for each model may be entirely different from another. For the workers ability to react properly in an emergency situation, that worker should be aware of the type of control system found on all the machines within that particular mine (and know how to basically operate that machine). However, under normal conditions, no general worker is permitted to operate these machines.

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PROGRAM D-2 STUDENT NAME ____________

UNIT 02 MODULE 03 TASK 010 INSTRUCTOR ____________

DATE COMPLETED ____________ INSTRUCTOR'S INITIALS ____________

TASK TITLE: *Safe Practices When Dealing with Electricity.*

Objective:

After studying the information sheet, the student will state the two chief sources of electrical accidents, safety precautions to follow and the proper procedure to use when coming in contact with a victim suffering electrical shock by answering all review questions to 100% accuracy.

Procedure:

1. Read the objective several times.
2. Study the information sheet.
3. Answer all review questions.

Review Questions:

1. Name the two chief sources of electrical accidents.

2. Which two body parts are most often injured from an electrical accident?

3. Why is the path between the hands extremely dangerous?

4. What is the best method for touching a conductor when necessary? Why?

5. Where is the master switch located?

6. Why is water and electricity a deadly combination?

7. Briefly describe two methods for separating an electrocuted victim and an electric wire.

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REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. Richard Farren

PROGRAM D-2 UNIT NO. 02 MODULE NO. 03 TASK NO. 010

INFORMATION SHEET

Mining is a dangerous and hazardous business. Some of these hazards are almost impossible to completely eliminate. Although there are many applications of electrical power which can cause electrical hazards, electricity need not be a hazard unless it is carelessly handled. Constant alertness on the part of all miners is an absolute necessity.

Electrical hazards can be categorized as either accidents causing bodily injuries or those causing fires. Over 96 percent of all electrical accidents are caused by (1) arcs resulting in burns, (2) electrically generated heat resulting in burns and scalds and (3) electrocution and shock. Fires are classified according to the ignition souce, such as electrical arcs, overload, etc. The main sources of electrical accidents are as follows:

CABLES	32%	= almost half of the accidents
TROLLEYS	16%	
SWITCHES	13%	
HAULAGE	10%	
ALL OTHER	29%	

The parts of the body most often injured are as follows:

EYES	34%	= over half
HANDS	27%	
MAJOR BODY PARTS	14%	
FINGERS	5%	
ALL OTHERS	20%	

Personal Safety and Electric Currents

One milliamp is the level of current at which a person will feel a shock. Just 0.1 ampere of alternating current flowing through a vital part of the body is fatal. The path between the hands is the most dangerous because the currents may cause heart interruptions. The only safe way to work around electricity is with one hand in the pocket to prevent any current from passing through the heart. If it becomes necessary to touch a conductor, use the back of the hand. Since an electrical shock will cause the muscles to contract, the hand will jerk away from the conductor. Never work on an electrical line or circuit until the master switch has been located on the distribution box and disconnected. Never turn the power on or off while touching a wet area. The resistance of dry skin is over 100,000 ohms while the resistance of wet skin is only 1000 ohms. High voltage wires hold the charge, even when disconnected from the power source. Never attempt to touch broken electrical wires which are touching the ground with any object. Find someone to guard it while notifying the proper authorities.

Procedures for Dealing With an Electrocuted Person

When coming in contact with a person suffering from electric shock, remember never to directly touch him.

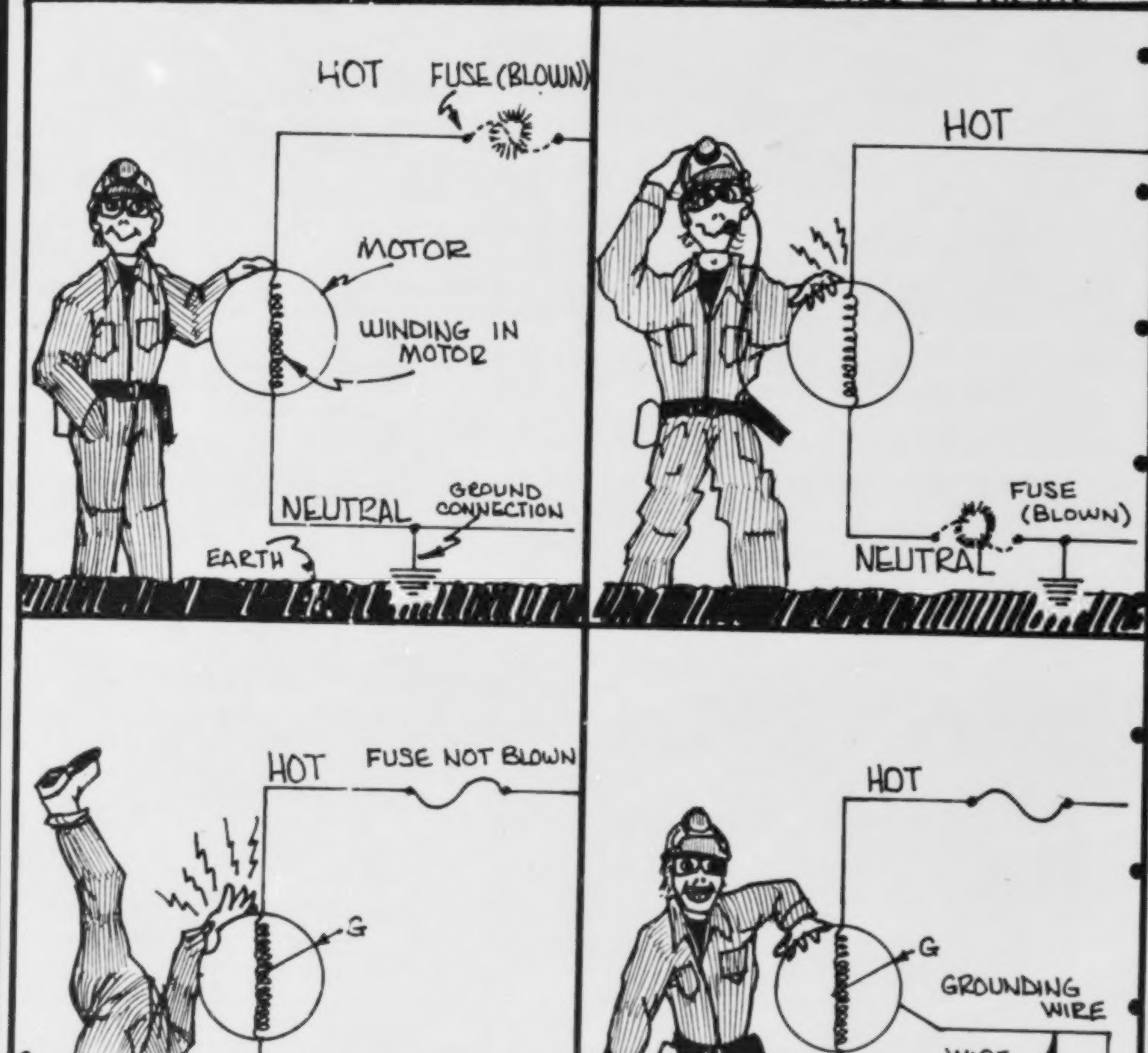
PROGRAM D-2 UNIT NO. 02 MODULE NO. 03 TASK NO. 010

Use the following procedure:

1. Remove the victim from contact. Either remove the electrical wire from the victim by using a wooden plank, prop or other nonconductive material or remove the victim from the electrical wire by using a belt or rope to dray the victim to safety. Never touch the victim while he is still in contact without using a nonconductive material.
2. Determine if the victim is alive.
3. Keep the victim from moving.
4. Do not give stimulants.
5. Proceed with artificial respiration.

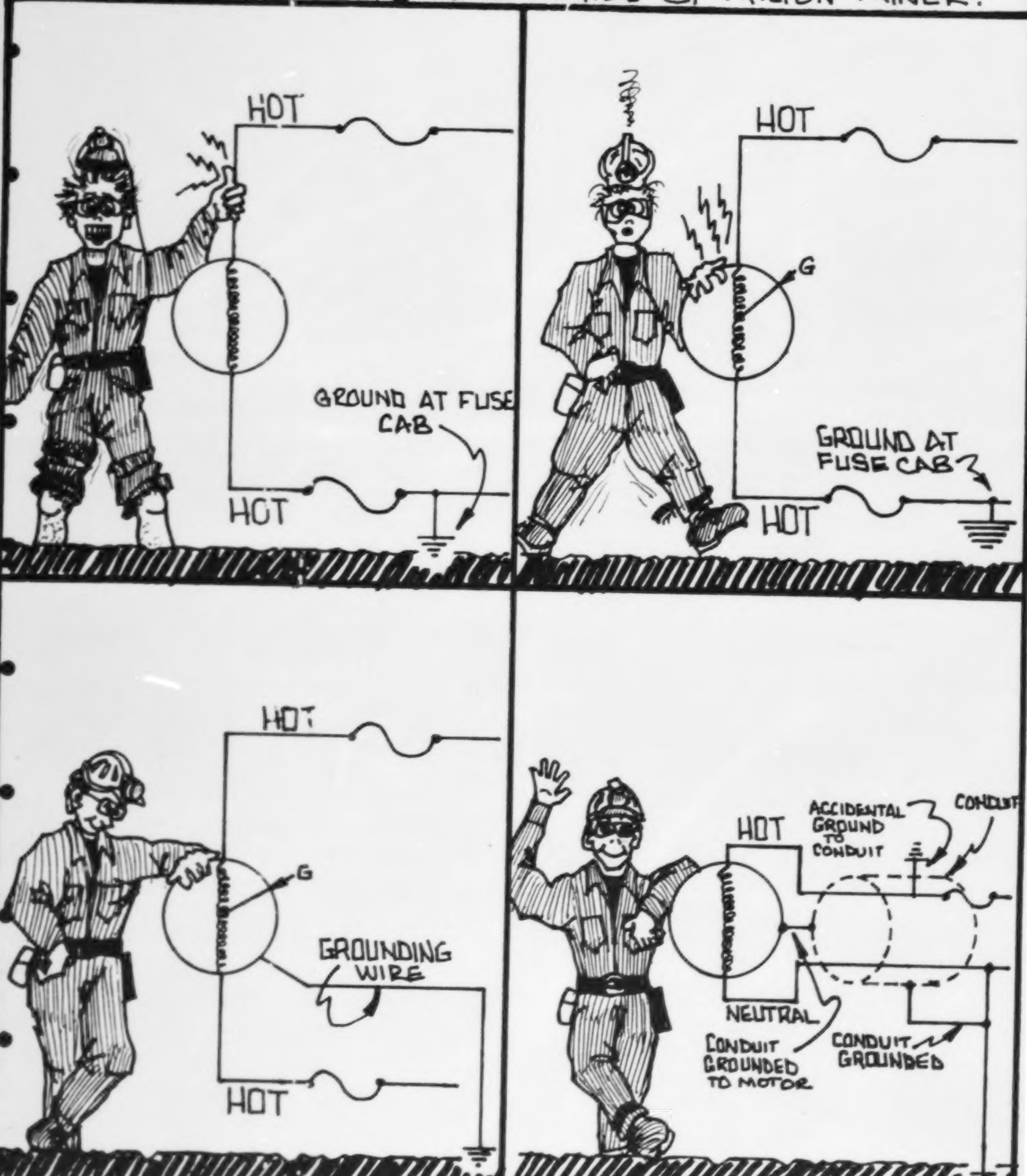
PROGRAM D-2 UNIT NO. 03 MODULE NO. 03 TASK NO. 010

MILTON MINER DEMONSTRATES DANGERS IN ELECTRICAL WIRING.


HOT
FUSE (BLOWN)
MOTOR
WINDING IN MOTOR
NEUTRAL
GROUND CONNECTION
EARTH
HOT
FUSE (BLOWN)
NEUTRAL
HOT
FUSE NOT BLOWN
G
NEUTRAL
HOT
G
GROUNDING WIRE
WIRE
INTER-CONNECTION AT FUSE CABINET
NEUTRAL

ISSUE: 1

MORE DANGERS IN WIRING DEMONSTRATED BY MILTON MINER.


HOT
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GROUND AT FUSE CAB
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G
GROUNDING WIRE
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HOT
ACCIDENTAL GROUND TO CONDUIT
CONDUI
NEUTRAL
CONDUIT GROUNDED TO MOTOR
CONDUIT GROUNDED

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PROGRAM D-2
UNIT 02 MODULE 03 TASK 020
DATE COMPLETED

STUDENT NAME
INSTRUCTOR
INSTRUCTOR'S INITIALS

TASK TITLE: *Safe Practices when dealing with electrical cables and lines.*

Objective:

After studying the material, the student will identify the hazards of electrical cables and the prevention of electrical accidents to the satisfaction of the instructor by answering the review questions accurately.

Introduction:

Most mine equipment is powered by some form of electricity. Electrical current can be a hazard if not properly regulated and handled. To insure the safety of the mine, a worker should be able to identify all electrical equipment and the hazards that could result from misuse of that equipment.

Procedure:

1. Reread the objective.
2. Study the information sheet.
3. Answer all review questions.

Review Questions:

1. If any damage to electrical cables is discovered, what should be done?

2. What is 'snubbing"?

3. What is a trolley wire? Explain!

4. Who may repair damaged cables?

5. Who should attach trolley nips?

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REVIEWED & APPROVED
RESEARCH MSK INSTRUCTOR
ADMINISTRATION

PREPARED BY: Mr. Michael Most

PROGRAM D-2 UNIT NO. 02 MODULE NO. 03 TASK NO. 020

INFORMATION SHEET

Trailing Cables:

The electrical cable that energizes tram machinery is called a trailing cable. These cables are found on the floor of the mine because the tram vehicle must be able to move in several directions. The trailing cable will be automatically released by the vehicle as it moves and will be "reeled in" as the vehicle returns. Since these cables are constantly being moved and often pulled against the rib, they may be easily damaged.

The worker should try to keep trailing cables out of the mine water and out of the way of any moving tram vehicle. If a vehicle should run over a trailing cable, the weight of the vehicle will crush the cable. Any damage to the cable may cause an electrical arc which, in turn, may cause an electrical fire or explosion. Therefore, the worker should "spot check" the cable before each shift begins. Report any damages to the foreman before work begins.

Unnecessary strain on a trailing cable will cause the cable to break or disconnect at the machine or the power source. (Even though most connections are made with strong metal adaptors.) Braces are used to help prevent the strain from damaging connections. A strain relief clamp is used to attach the cable to the machine. To prevent the cable from pulling loose at the power source, a procedure called "snubbing" is used. In both cases, the brace puts the strain on an object (the machine body, a roof jack or post) much stronger than the cable itself. (See fig. 1 and 2)

STRAIN RELIEF CLAMP WITH SECURING CHAINS.
FIG. 1

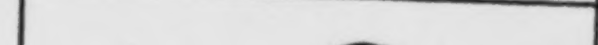


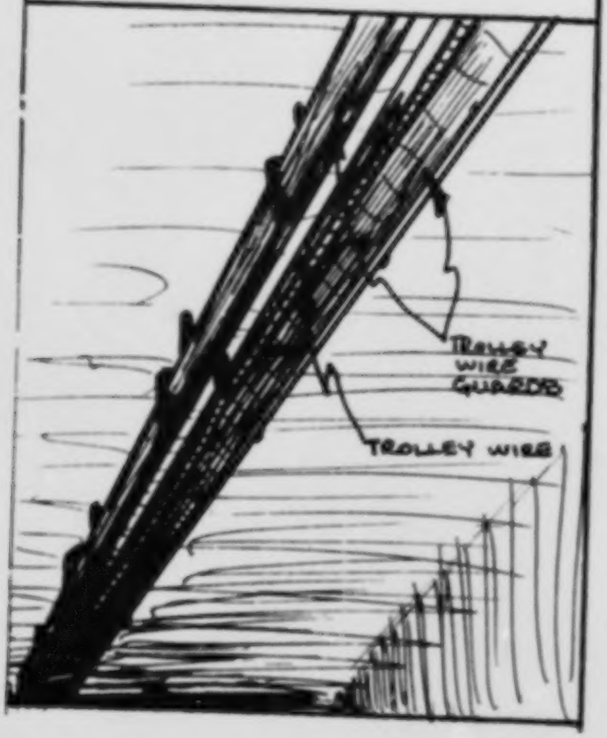
FIG. 2 TRAILING CABLE SNUBBED TO ROOF SUPPORT

NOTE SECURE CHAIN

Where splices in the cable are located, check for damages and be sure the seal is watertight. Splices can be easily damaged when pulled against the rib or onto the vehicle.

Trolley Wires -
The trolley wire is probably the only exposed wire in the mine. This wire is the main power line and is used to power almost all of the equipment in the mine. It's usually found hanging on insulated hooks in the roof and over the tracks. These wires cannot be insulated since the poles of track equipment must make direct contact with the line. Trolley wires are very dangerous since they must carry a lot of power to energize the equipment. And since these wires are exposed, a worker may be severely burned or even killed simply by touching the wire. (Remember that current can pass through a tool and also electrocute the worker.) See Fig. #3.

FIG. 3 TROLLEY WIRE AND GUARDS



A guard is generally placed around the wire to prevent workers from accidentally touching it. However, the heat generated by the current in the wire may cause the wire to sag or break. If the wire does sag below the guard, the worker should report the location of the sag to the section foreman.

Some basic rules concerning the trolley wires are:

1. Never enter a man-trip car from the trolley wire side.
2. When walking along a track entry, stay on the side opposite the trolley line.

3. Report a sagging trolley wire to the foreman.

Trolley Nips -
Some tram equipment is energized directly from the trolley wire. A trolley tap or nip is used to attach the trailing cable to the trolley wire. Nips should be clearly labeled to show what machine is energized by attaching that nip. Attaching the wrong nip may energize a machine that was supposed to be stopped. (A miner that is being worked on, a shuttle car with no operator, a cable being spliced.) Always trace a cable back to the machine to be sure that the proper nip is being used. See Figure #4.

FIG. 4 TRAILING CABLE CONNECTOR USED TO CONNECT POWER CABLES TO TROLLEY WIRES.

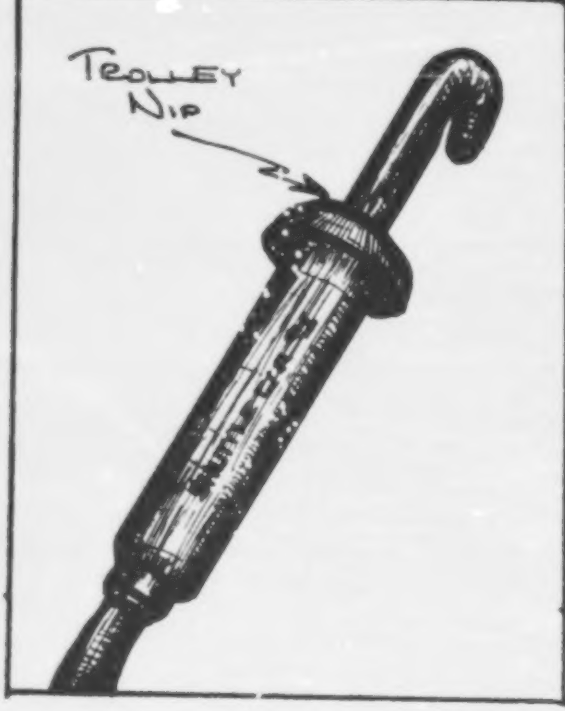
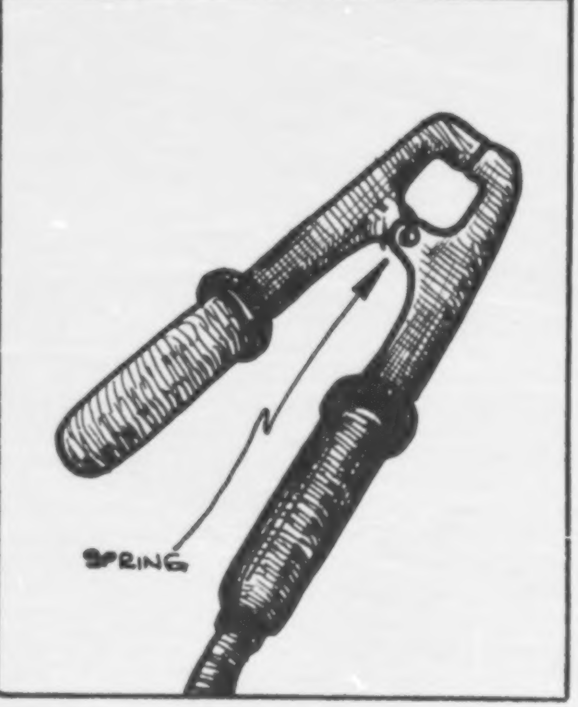


FIG. ANOTHER TYPE OF TROLLEY NIP (CLAMPING)



When attaching a nip to the trolley wire an electrical arc may occur briefly and a blinding flash of light will also occur.

For these reasons, a number of safety precautions should be observed when working with trolley nips:

1. Attaching nips is a job which should be left to the more experienced miners.
2. Never turn your head when attaching a nip and always wear safety glasses.
3. If a flash occurs when another miner is attaching a nip, he may be temporarily blinded. Help him!
4. Do not attempt to repair a nip, there are qualified electricians to do this.

Feed Lines

Many different power lines are called "feed lines". Basically, the purpose of feed lines is to carry electricity from a power station to the working section.

In general all feed lines are insulated and suspended from the roof or buried underground. They may carry as much as 13,800 volts but generally carry 4160 or 7200 volts.

All feed lines will start at a particular power source. One commonly used feed line is bonded directly into the trolley line, but most forms are connected into a switchhouse.

After the feed line leaves the power source it follows the entries until it reaches the working section. Feed lines are most often hung from the roof in the same manner as trolley wires. If the feed line runs parallel to the trolley wire, a system of connectors attach it to the same hooks that suspend the trolley wire. (See Fig. #6). In this method, the feed line can absorb any overload in the trolley and the two lines balance the power in each other.

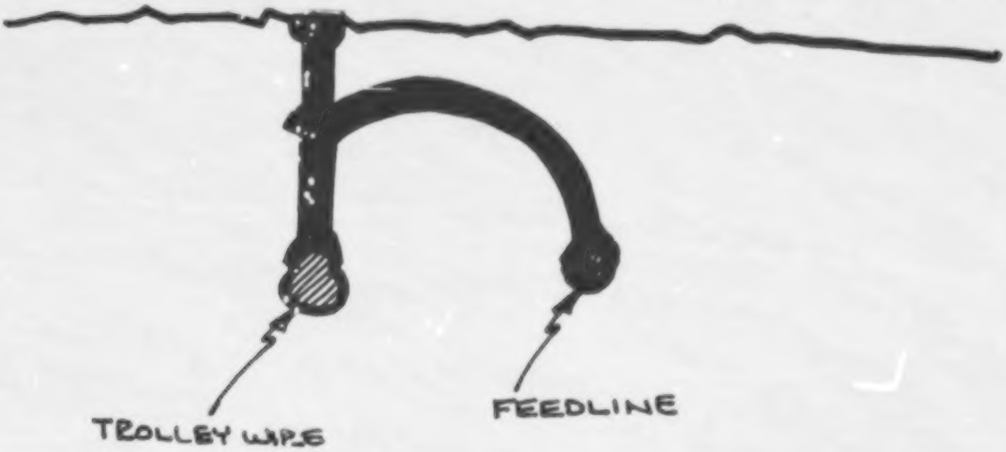


FIG.6 FEEDLINE

In the working section, the feed line will connect to a station designed for distributing the power to the face equipment. A nipping station is often used in the section. This station is simply a large box with the exposed feed line running through it. The bottom is covered by a rubber mat under the nipping station to prevent the worker from being shocked by the nip. (The worker must be sure to stand on this mat when attaching nips.) Standard equipment nips with rubber insulators are used to attach the trailing cables to the nipping stations.

Most mines are now using distribution boxes to replace the nipping station. These boxes (Fig. #7) and connections are much safer to use than nips. However, any disconnected cable should not be connected until the trailing cable and machine have been inspected. Warning tags are used to warn all workers that the cable is disconnected so

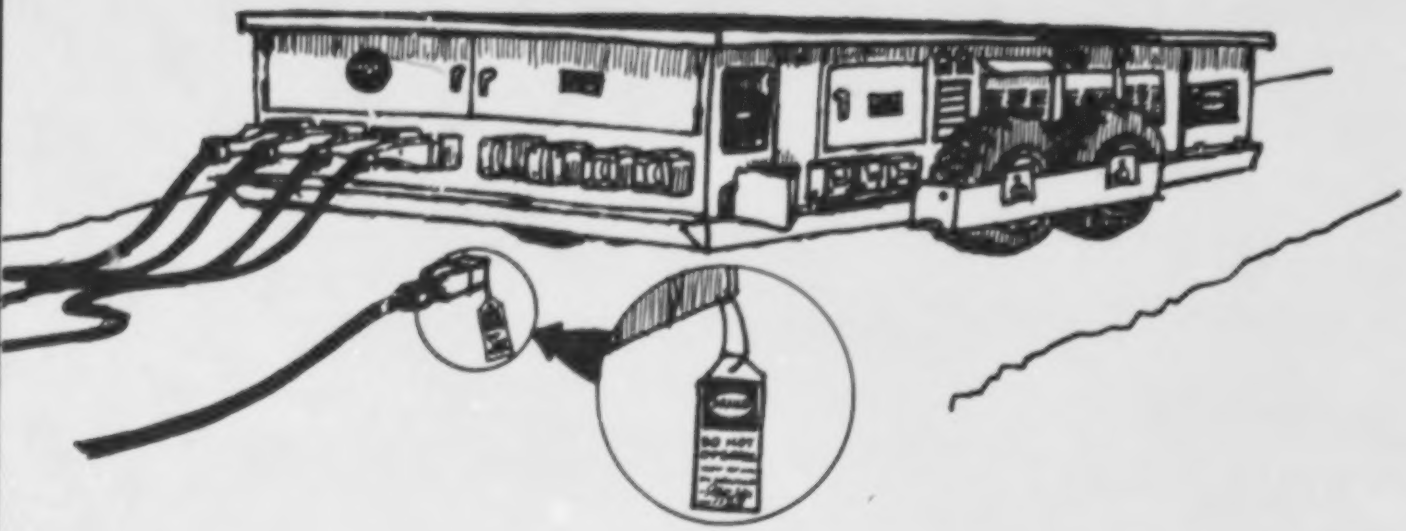


FIG.7 DISTRIBUTION BOX

the equipment or cable may be repaired. In this case, the mechanic or electrician will reconnect the cable. Do not connect any cables unless a qualified worker inspects all connections and equipment to make sure they are safe.

High Voltage Lines

These electrical lines carry high voltage from the sub-station into switchhouses and distribution boxes. They are hung from the ceiling and are usually very well protected and insulated. If properly cared for by mine electricians they are no danger to the worker.

However, high voltage cables can hold a charge even after being disconnected from the source. Touching either end may cause serious injury to the worker. For this reason, caps are chained on the ends of all high voltage wires. These caps screw securely over the exposed connections and prevent the electrical charge from injuring any worker. Never transport or touch high voltage wire, unless both caps are in place.

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PROGRAM D-2

STUDENT NAME

UNIT 02 MODULE 04 TASK 010

INSTRUCTOR

DATE COMPLETED

INSTRUCTOR'S INITIALS

TASK TITLE: *Mine Gases.*

Objective:

After reading the information sheet, the student will differeniate between mine gases, their properties, by answering the review questions to 80% accuracy and completing the GAS CHART.

Procedure:

1. Read and reread the objective.
2. Study the information sheet.
3. Answer all review questions.
4. Complete the GAS CHART.

Review Questions:

1. Which gas is the most essential for a safe and healthy atmosphere?

2. What is the lowest percentage of oxygen allowed in the mine?

3. Name the effects of oxygen deficiency on the body.

4. Briefly explain the relationship between excessive nitrogen and oxygen deficiency.

5. From what is carbon dioxide formed?

6. Which gas makes up the largest portion of the normal atmosphere?

7. What gas causes deep, fast breathing even in small amounts?

8. What gas has caused more than 10,000 deaths in mines?

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INSTRUCTOR

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PREPARED BY: Mr. Ronald Bellock

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9. What is the least percentage of methane permitted in the mines according to Federal law?

10. What gas may appear after a fire or explosion?

11. Which of the human senses (see, hear, smell, touch, taste) can be used to detect sulfur dioxide? Hydrogen sulfide?

12. What effects does nitrogen oxide have on the human body?

13. Which oxide gas has a reddish-brown color when found in large amounts?

14. Where may ethane, propane and butane most likely be found in the mines?

15. - 20. Complete the Gas chart below.

GAS CHART

NAME OF GAS	OXYGEN	NITROGEN	CARBON DIOXIDE	CARBON MONOXIDE	METHANE	HYDROGEN SULFIDE
CHEMICAL FORMULA.				CO		
IS IT COMBUSTABLE			NO			
DOES IT SUPPORT COMBUSTION.	YES					
METHODS FOR DETECTING.						ODOR, CHEM. ANALYSIS, SPECIAL DETECTORS
EXPLOSIVE RANGE % IN AIR.		NONE				
EFFECTS ON LIFE.					DEATH IN HIGH CONCENTRATIONS OTHERWISE NO ILL EFFECTS	
PERCENTAGE ALLOWED IN MINES BY FEDERAL LAW.		X		LIMIT IS .005%		

PROGRAM D-2 UNIT NO. 02 MODULE NO. 04 TASK NO. 010

INFORMATION SHEET

Mine Gases

Among the many dangers which pose hazards underground are gases produced by the earth or by mining operations. With the proper knowledge of these dangerous gases and the proper use of gas detectors, the miner can take measures to prevent damage to himself and/or fellow workmen.

Air is a mixture of gases and those gases found in mine air include oxygen, nitrogen, carbon dioxide, carbon monoxide, methane, hydrogen, sulfur dioxide, hydrogen sulfide and nitrogen oxides.

Oxygen (O_2)

The most essential gas, oxygen, is found naturally in the air and is needed to support life. Oxygen is a colorless, ordorless, tasteless, noncombustible gas which is slightly heavier than air. It is the only gas that supports combustion.

Too little oxygen is harmful. The normal oxygen content in air is about 21%, amounts less than 19/5% is dangerous but man can survive in air containing above 9%. The least percentage allowed by Federal law (91-173, Section 303b) is 19.5%.

The Flame Safety Lamp is the most common method for detecting oxygen deficiency. The test is made near the floor. If the oxygen level is below 16 1/2%, the flame will elongate and then go out.

Oxygen deficiency causes buzzing in the ears, a rapid heartbeat, blueness under nails and on lips and an overall dizzy feeling.

Nitrogen ($N2$)

Nitrogen which takes up 78% of the air, is also a colorless, odorless, tasteless, noncombustible gas. It is lighter than oxygen.

Nitrogen becomes dangerous when present in an excessive amount. It is not the nitrogen which is actually harmful but rather the oxygen deficiency which results from the nitrogen driving out the oxygen. Thus, the Flame Safety Lamp can be used indirectly to detect their presence of excess nitrogen or carbon dioxide.

Carbon Dioxide (CO_2)

Carbon dioxide, which makes up .03% of the air, is formed by living animals, fires and explosions. In a mine, oxygen combines with the carbon in the coal to form CO_2. Carbon dioxide is colorless and odorless but gives an acid taste when moist or present in large amounts. It is heavier than other gases in the air so it concentrates near the floor. Since CO_2 does not support combustion, it is used to fight fires.

Federal law (75.301) requires not more than 0.5% of carbon dioxide present in mine air. Even at this level, miners breathe a little deeper and faster because their lung ventilation increases.

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Carbon Monoxide (CO)

Carbon monoxide is a colorless, tasteless, ordorless, nonirritating, but very harmful, gas. It is a product of incomplete combustion of solid liquid or gaseous materials but contain carbon, such as in a fire.

Even a very small amount of CO in the air is poisonous and deadly to man. In small amounts, carbon monoxide will be fatal only after a period of time, but in large quantities, it is an instant killer. The limit set by Federal law (75.301) is .005% of the total air. CO does not support combustion, but it is quite flammable, with an explosive range at 12.5 to 74%.

Special instruments, such as the Bacharach and the MSA CO Tester, are used to detect and measure the carbon monoxide in mine air. Symptoms vary according to the percent of carbon monoxide in the air.

Concentrate of	Symptoms
.02%	headache, physical and mental dullness
.06%	headache less than 1 hr. unconsciousness in 2 hr.
.1%	unconsciousness in 1 hr. fatal in 4 hr.
higher than .1%	immediate unconsciousness death in few minutes

Methane (CH_4)

Methane, anotner colorless, tasteless dangerous gas, is commonly released from coal and rocks containing combustible materials. Because it is lighter than air, it rises to the roof of a mine. Methane becomes highly explosive when mixed with the normal amount of oxygen. Methane explosions are also bred by open flames, sparks and coal dust. Like nitrogen, methane becomes an asphyxiant by diluting the oxygen in the air.

Methane is very easily ignitible, with an explosive range of 5 to .15%. In the mines, any concentration of 1.0% is considered dangerous and is not permitted according to federal law (75.307). Tests must be made at the beginning of each shift and every 20 minutes during each shift. Hand held methometers (methane detectors) are used to measure the amount of methane present. Also methane detectors, located on the front of each continuous miner, will immediately shut down the machine when 2% is detected.

Over 10,000 deaths have been caused by methane gas in coal mines over the past 60 years.

Hydrogen (H_2)

Hydrogen, a colorless, odorless, tasteless gas which forms flammable mixtures when found in large quantities (4%. It is not often found in the mine unless a fire or explosion has occurred, although small quantities may be found near a battery-charging station. Hydrogen is lighter than air and tends to rise to the roof of a mine

Sulfur Dioxide (SO_2)

Sulfur dioxide is a colorless, suffocating, irritating gas with a strong sulfurous (sweetish) smell and taste. It is heavier than air and does not support combustion.

Sulfur dioxide is very poisonous, even in small amounts. Only .0005% is permitted in a mine.

Hydrogen Sulfide (H_2S)

Hydrogen sulfide is a colorless, toxic, flammable gas that has a sweetish taste and a disagreeable odor of rotten eggs. It is combustible with an explosive range of 4.3 to 46%.

H_2S is harmful at .001%.

H_2S is more poisonous than carbon monoxide and is considered harmful at .001%. Unlike CO, H_2S can be detected by its odor but unfortunately prolonged exposure to hydrogen sulfide tends to dull the sense of smell.

Nitrogen Oxides

Nitrogen itself is a normally harmless, however, most nitrogen oxides are toxic because they form very corrosive acids when mixed with moisture in the lungs. Nitrogen oxides are formed at high temperatures by diesel or gas engines, electrical discharges or blasting.

Nitrogen oxides can be found in various forms.

NITRIC OXIDE (NO): Nitric oxide enters the throat and lungs and forms an acid causing irritation. Although this irritation may seem to subside for a few days it may still cause sudden death. The atmosphere is considered unsafe when nitric oxide reaches 25 ppm (parts per million parts of the air.)

NITROGEN DIOXIDE (NO_2): Nitrogen dioxide, considered one of the most dangerous mine gas, is produced by incomplete detonation of some explosives. Like NO, it also causes throat irritation and is dangerous in small amounts. In large amounts, nitrogen dioxide has a reddish-brown color. The atmosphere is harmful at 5 ppm.

Other Gases

Ethane, propane and butane are three gases which are seldom in the mines but may concentrate near oil or gas wells. When present in large amounts they increase the possibility of fire or explosion. Ethane is harmful at 3.0% , propane at 2.1% and butane at 1.8%.

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PROGRAM D-2	STUDENT NAME
UNIT 02 MODULE 04 TASK 020	INSTRUCTOR
DATE COMPLETED	INSTRUCTOR'S INITIALS

TASK TITLE: *Mine Damps.*

Objective:
After studying the information sheet, the student will differeniate between mine damps, explain their causes, effects and methods for detecting them and answer all review questions to 80% accuracy.

Procedure:
1. Read the objective at least twice.
2. Read and review the information sheet.
3. Answer all review questions.

Review Questions:
1. What gas is commonly associated with firedamp?
2. Why does the presence of hydrogen make afterdamp extremely dangerous?
3. What gas is most responsible for the effects of afterdamp? Name those effects.
4. Why is a flame safety lamp useful for detecting blackdamp?
5. Briefly explain why stinkdamp and chokedamp are so named.
6. What is meant by white damp?
7. Which mine damps can be detected by their smell?
8. Which mine damp results in oxygen deficiency?

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PREPARED BY: Mr. Ronald Bellock

9. Which mine damp is considered the most common?

10. Define: mine damp.

INFORMATION SHEET

A mine damp is the general term for a mixture of gas products formed in coal mines as distinguished from pure air.

FIREDAMP is the term applied to any explosive or flammable mixture of gases, mainly methane and air because as this mixture will burn or explode when ignited. Other gases present in the firedamp may increase or decrease the chance of explosion, depending on whether they are explosive (such as carbon monoxide) or extinctive (such as carbon dioxide).

AFTERDAMP is a mixture of gases resulting from a mine fire or explosion. This mixture includes carbon monoxide, carbon dioxide, water vapor, nitrogen, oxygen, hydrocarbons and hydrogen. Afterdamp is extremely dangerous: it may be flammable, poisonous or both. It may be detected by its creosote smell. Because of its carbon monoxide content, the effects of afterdamp are unconsciousness and death within a few minutes.

BLACKDAMP is any mixture of air and mine gases, (mainly carbon dioxide and nitrogen) that contains so little free oxygen that is causes distress or suffocation. Since the lack of oxygen will put out an open flame, a flame safety lamp is excellent for detecting blackdamp.

WHITEDAMP is any mixture of mine gases which contains a dangerous amount of carbon monoxide.

STINKDAMP or STONEDAMP is any mixture of mine gases which is detectable by a hydrogen sulfide odor (rotten egs). Stinkdamp may appear during normal mine operations.

CHOKEDAMP or STYTHE is another name for blackdamp in which there are irritant gases or smoke. The choking or distress caused by breathing chokedamp has given it its name.

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PROGRAM D-2 STUDENT NAME __________

UNIT 02 MODULE 04 TASK 030 INSTRUCTOR __________

DATE COMPLETED __________ INSTRUCTOR'S INITIALS __________

TASK TITLE: *The History and Principle of Operation of the Flame Safety Lamp.*

Objective:

After studying the information sheet, the student will answer all review questions dealing with the history and principle of operation of the flame safety lamp and score at least 75% on the review questions.

Procedure:

1. Read the objective several times.
2. Read and review the information sheet.
3. Study the illustrations.
4. Answer all review questions.

Review Questions:

1. Who invented the first flame safety lamp?

2. Why was the discovery that a flame would not pass through a gauze important?

3. Who discovered this?

4. What improvements did Muessler add to the flame safety lamp? Marsaut?

5. Even with the use of other methods of lighting in the mines, why is the flame safety lamp still used?

6. What does the increase in the height of the flame indicate?

7. What does the decrease in the height of the flame indicate?

8. What is the only permissible flame safety lamp manufactured for use in mines today?

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PREPARED BY: Mr. Ronald Bellock

PROGRAM D-2 UNIT NO. 02 MODULE NO. 04 TASK NO. 030

INFORMATION SHEET

Three hundred years ago, coal miners worked by the light of open candles which would often ignite methane gas resulting in hundreds of deaths. The methods used to detect methane were dangerous and unreliable. The first safety lamp was invented in 1813 by Dr. Clanny but was not safe at all. In 1815, Sir Humphrey Davy improved that lamp with the discovery that a flame would not pass through a wire gauze. The wire gauze cools the flame and acts as a barrier to the flame but still allows the flame to pass through it.

Davy's lamp was used primarily for its safe light but eventually became the main device for detecting methane and lack of oxygen in the mine air. The gauze would allow methane to pass through the flame, which would ignite the methane and burn inside the lamp. The gauze would not allow the flame to pass into the mine air which might cause an explosion. (See fig. 1) But because the flame were shaded by the gauze, the lamps did not give a bright light. Dr. Clanny, who had invented the very first safety lamp, remedied the situation by enclosing the flame in a glass cylinder and putting the wire gauze above the glass. Muessler made the lamp safer in 1840, by putting a metal chimney inside the wire gauze to guard against explosions inside the lamp. In 1871, Marsault added a metal bonnet to protect the gauze from damage and to prevent a strong current from blowing across the flame, thus designing the safest lamp yet. When it was discovered that the flame would rise higher in the presence of methane gas, the safety lamp also became a means of detecting methane.

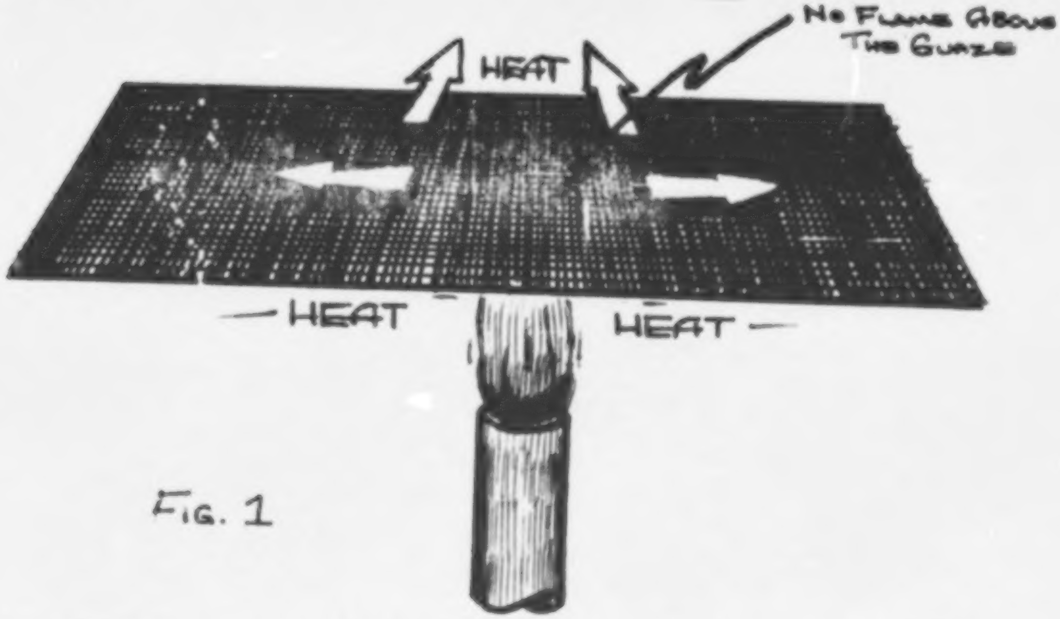
No Flame Above The Guaze
HEAT
HEAT
HEAT

Fig. 1

When electric cap lamps and other methods of lighting were introduced in the mines, the safety lamp was unnecessary as a working light but it had become a common way of testing for methane. It was also discovered that since the lamp needs oxygen to burn with a flame, a decrease in oxygen would cause a decrease in the size and brightness of the flame. Thus, the safety lamp became a common way of testing for lack of oxygen or black damp. By providing a safe light and a

PROGRAM D-2 UNIT NO. 02 MODULE NO. 04 TASK NO. 030

safe reliable way to detect methane gas and oxygen deficiency, the flame safety lamp became a valuable addition to the mining industry.

The only permissible flame safety lamp manufactured today is the Koehler lamp.

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PROGRAM D-2

STUDENT NAME

UNIT 02 MODULE 04 TASK 040

INSTRUCTOR

DATE COMPLETED

INSTRUCTOR'S INITIALS

TASK TITLE: *Disassembly, Assembly, and Maintenance of the Flame Safety Lamp.*

Objective:

After studying the information sheet and a demonstration by Instructor, the student will correctly take apart the flame safety lamp, clean, inspect, refill and put it back together to the satisfaction of the instructor.

Reference:

Demonstration by Instructor.

Tools and Materials:

1. Koehler Flame Safety Lamp
2. Magnet
3. T-fork
4. Soft brass bristle brush
5. Clean cloth or rag

Procedure:

1. Read the objective at least twice.
2. Demonstration by Instructor.
3. Read and review information sheet.
4. Study illustrations.
5. Take apart the flame safety lamp.
6. Clean, inspect and refill the lamp.
7. Put the lamp back together.
8. Have Instructor check the lamp.

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ADMINISTRATION

PREPARED BY: Mr. Ronald Bellock

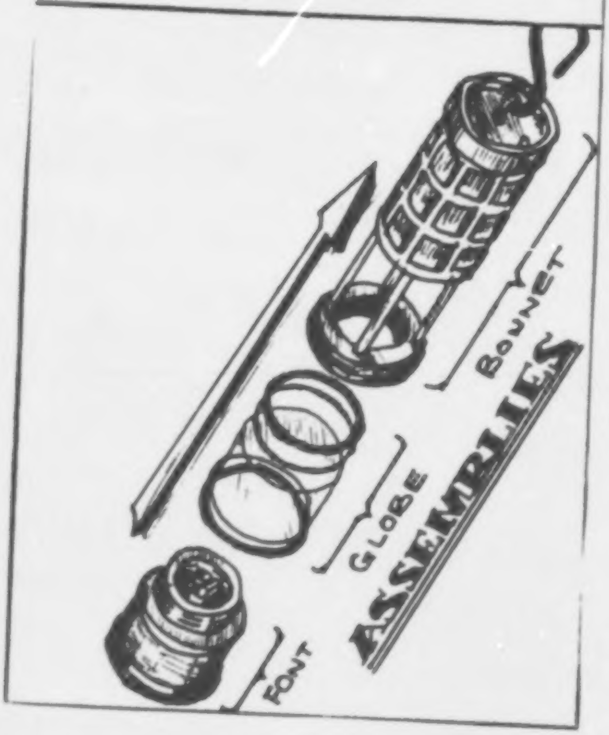
PROGRAM D-2 UNIT NO. 02 MODULE NO. 04 TASK NO. 040

INFORMATION SHEET

The permissible flame safety lamp provides the mining industry with a source of safe light and a reliable way to detect dangerous gases. It is an important piece of safety equipment which must be cared for properly.

The Koehler Flame Safety Lamp is the only lamp presently manufactured and approved by the U.S. Bureau of Mines. The lamp has three main assemblies, the font assembly, the globe assembly, and the bonnet assembly. See fig. 1.

FIG. 1 FLAME SAFETY LAMP ASSEMBLIES



FONT ASSEMBLY

The base of the lamp, or font assembly as shown in fig. 2 contains:

- -- The fuel storage tank which holds a twelve hour supply of fuel.
- -- the igniter assembly or striker which causes the spark used to light the lamp.
- -- the wick which draws up a steady fuel supply from the reservoir for combustion.
- -- the wick adjustment knob which is used to regulate the height of the flame.
- -- the igniter handle which is used to raise and rotate the igniter to make a spark.

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FIG. 2 PART 1 L'UB.-TANK, IGNITER AND WICK IN FONT ASSEMBLY

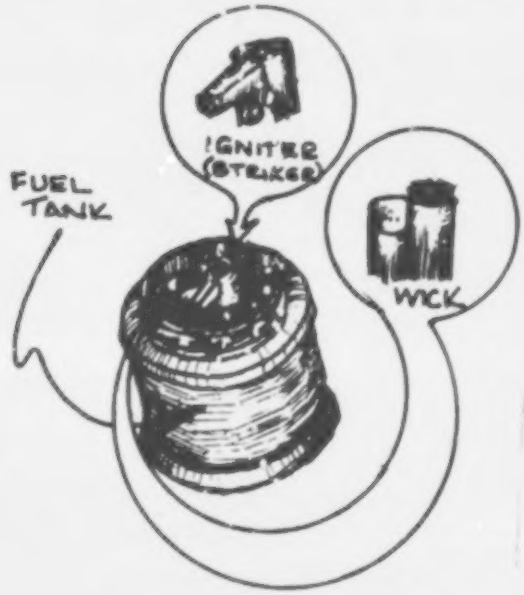

IGNITER (STRIKER)
FUEL TANK
WICK

FIG. 2. PART 2. WICK ADJUSTMENT KNOB AND IGNITER HANDLE

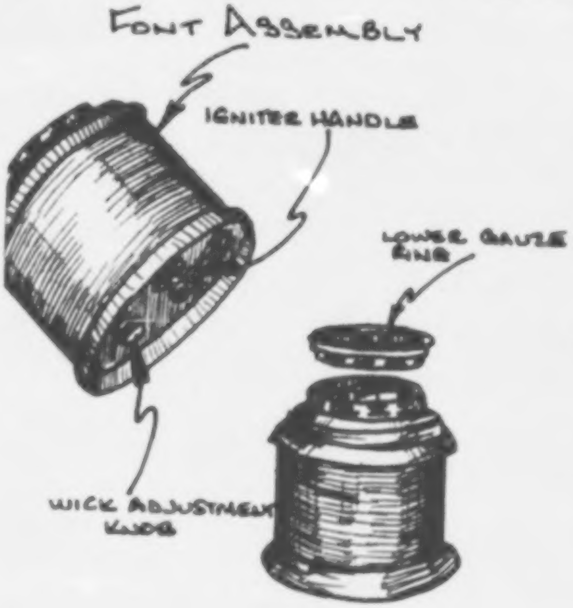
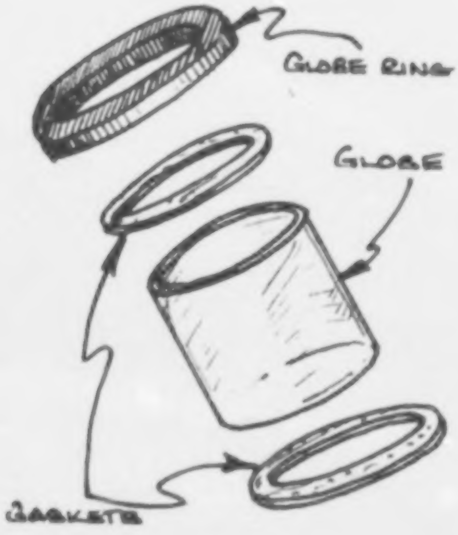

FONT ASSEMBLY
IGNITER HANDLE
LOWER GAUZE RING
WICK ADJUSTMENT KNOB

FIG. 3 GLOBE ASSEMBLY INCLUDING GLOBE, GLOBE RING AND GASKETS


GLOBE RING
GLOBE
GASKETS

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GLOBE ASSEMBLY

The middle section of the lamp, or globe assembly, as shown in fig. 3, contains:

- -- The glass cylinder or globe.
- -- two asbestos gaskets, one above and one below the globe, which are used to make a seal between glass and metal.
- -- the globe ring or gasket ring, which holds the upper gasket in its place.

BONNET ASSEMBLY

The top piece, or bonnet assembly, as shown in fig.4, contains:

- -- The hood and bonnet which protect the upper gauzes from high air current and other damages.
- -- the outer gauze which safety confines or restrains the flame by its fast cooling action.
- -- the inner gauze which like the outer gauze, also confines the flame and insures safety.
- -- the expansion ring which permits the globe to expand when heated by the flame.
- -- the standards which protect the globe from breakage.
- -- the magnetic lock which prevents the lamp from accidentally opening underground.

FIG.4 THE BONNET ASSEMBLY - EXPLODED VIEW

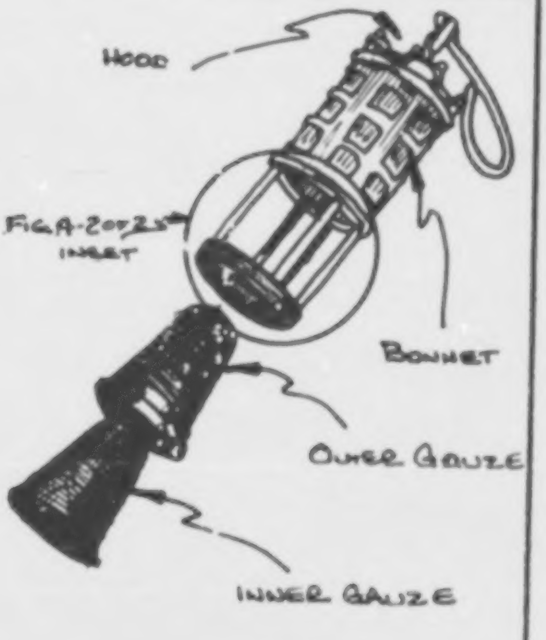
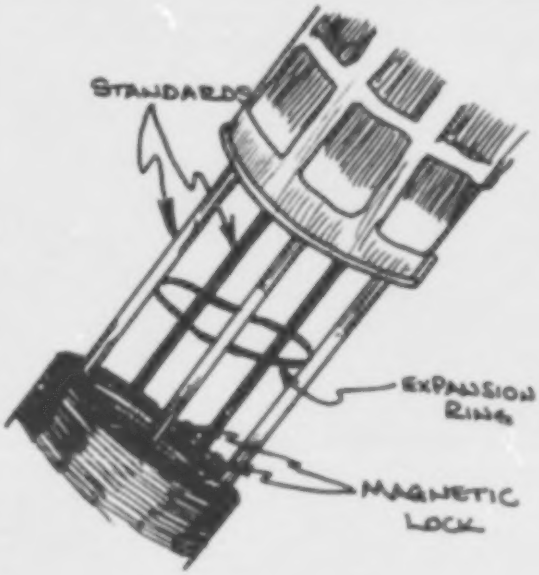


FIG.4 INSET OF BONNET ASSEMBLY



PROGRAM D-2 UNIT NO. 02 MODULE NO. 04 TASK NO. 040

Disassemble The Lamp

All the removable parts should be disassembled in the following order:

1) Unlock the lamp by placing a magnet on the two lock pins of the magnetic lock and turn the bonnet assembly counterclockwise until a click is heard, which indicates that the lock is free. (See fig. 5) Continue to unscrew the bonnet until it is separated from the fuel font, and then lift it straight up over the glass cylinder and off. (Flame safety lamps have magnetic locks to prevent them from opening in mine air which might contain combustible materials.)

FIG. 5. USING THE MAGNET TO UNLOCK ASSEMBLY BY TURNING IT COUNTER-CLOCKWISE

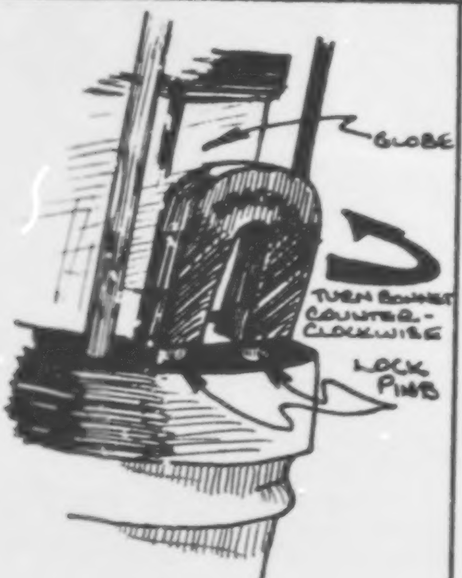
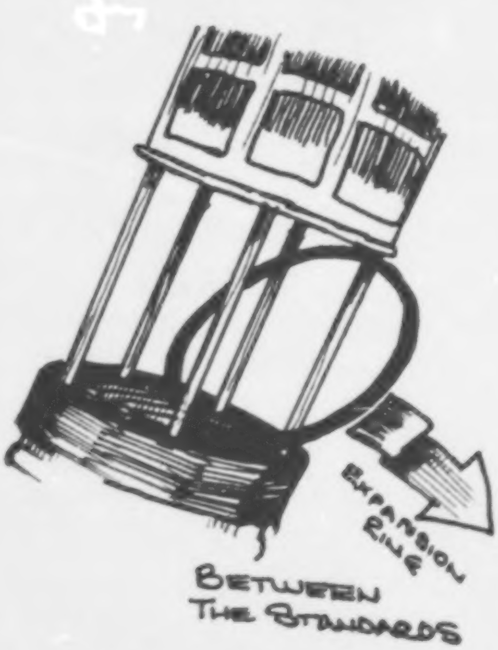


FIG. 6 REMOVING EXPANSION FROM BONNET ASSEMBLY



2) Remove the expansion ring by turning it up on edge and carefully pulling it out between the standards. (See fig. 6) Never force the expansion ring through the bottom of the bonnet assembly because the hole is not big enough and will bend the ring.
3) Carefully take out the outer and inner gauze.
4) Take out the globe ring, the gasket, and the glass globe.
5) Remove the lower gasket and the lower gauze ring.
6) Unscrew the igniter handle on the bottom of the font, remove the spring and lift the igniter out through the top of the font. See fig. 7.
7) The lamp is now broken down into its thirteen basic parts and is ready to be cleaned, refilled and inspected. (The thirteen parts include the bonnet, the expansion ring, the outer gauze, the inner gauze, the globe ring, the upper gasket, the globe, the lower gasket, the lower gauze ring, the fuel font, the igniter, the igniter handle and the igniter spring.)

FIG. 7 DISASSEMBLING THE FONT ASSEMBLY

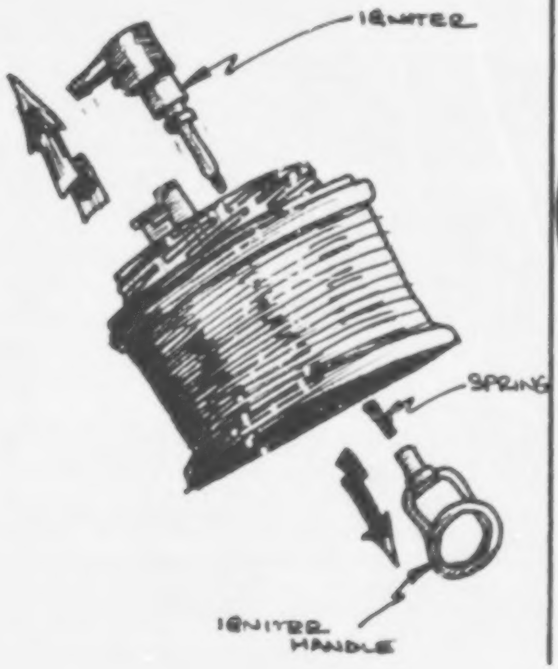
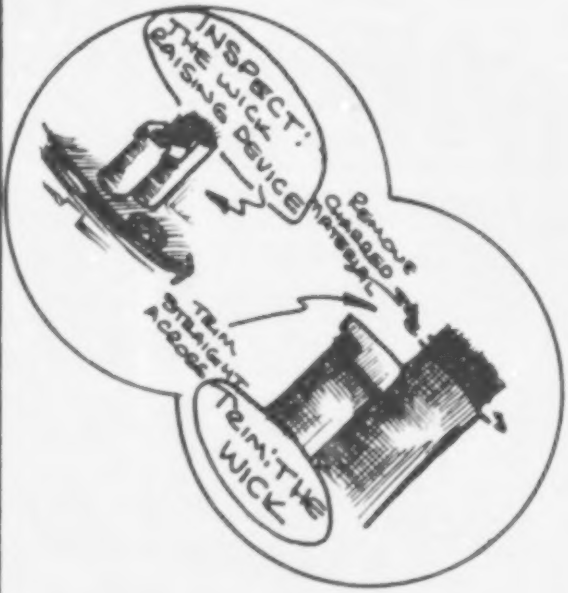


FIG. 8 INSPECTING AND TRIMMING THE WICK



Cleaning, Filling and Inspecting

1) Clean all dirt and deposits from the igniter file wheel and adjust the igniter to give a good spark by tightening the screw located in the end of the flint holder. (It many be helpful, when turning the file wheel, to temporarily screw the igniter handle back.)
2) If the flint is bad and needs replaced, take out the screw located in the end of the flint holder, remove the flint spring and bad flint and replace it with a new flint. Replace the spring, put the screw back in and adjust for a good spark.
3) Inspect the wick raising device to make sure the wick moves up and down when the wick adjustment knob is turned. Trim charred material from the wick. (Trim it straight across to assure an even flame. (See fig. 8)
4) To fill the lamp, remove the filler plug located in the top of the fuel font with a t-fork, (a special two pronged tool, See fig. 9). Fill the font at the lamp filling station in the lamp house. (The flame safety lamp uses a high grade gasoline called naptha.) Fill the font enough to completely soak the cotton packing inside. Do not let the fuel run over. Pour out excess fuel after each filling. Replace the filing plug, making sure it's tight.
5) Clean the inner, outer and lower gauzes by brushing them with a soft brass bristle brush or blowing them with low compressed air. Examine the gauzes for broken wires or holes which would allow the flame to pass through into the mine air. (Before a new gauze is used, the coating should be burned off.)
6) Clean the lower gauze ring in the same way. Check to make sure the ring has no holes and is level across the bottom (not bent).

FIG. 9 FILLING THE LAMP

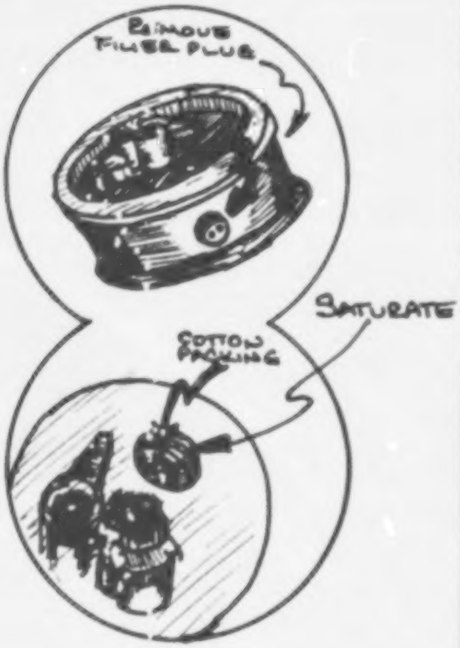
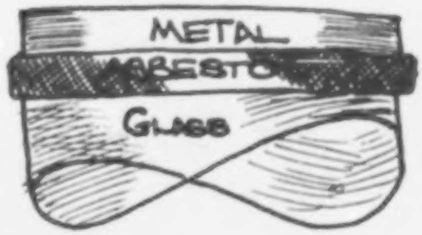


FIG. 10 ASBESTOS MATERIAL BETWEEN JOINTS



7) Clean the glass globe carefully, and inspect it for spots, cracks and chipped edges.
8) Carefully inspect the asbestos gaskets for defects and breaks. Bad gaskets should be replaced since they will not form an air-tight seal above and below the globe. (There is no difference between the upper and lower gasket; they are the same.) There must always be an asbestos gasket between glass and metal, as shown in fig. 10.
9) Clean the bonnet assembly of dirt and dust, and examine it for dents and cracks. Also check to make sure the nuts on top are tight, the standards are tight and in good shape and the spacers between the hood and bonnet are in place.

Reassemble The Lamp

Reassemble the lamp from the bottom up, properly examining each part and placing it in the right place.

1) Begin with the newly refilled fuel font. Put the igniter in the top of the font, down through the specially cut hole and turn the font over and inspect the spring around the igniter shaft. Now screw the igniter handle onto the end of the igniter shaft. See fig. 11.
2) Place the lower gauze ring and gasket on top of the fuel font. (The gasket fits inside the gauze ring.)
3) Making sure any writing on the globe is right side up, position the globe on top of the lower gauze ring gasket.

FIG. 11 REPLACING IGNITER, SPRING AND HANDLE INTO FONT ASSEMBLY

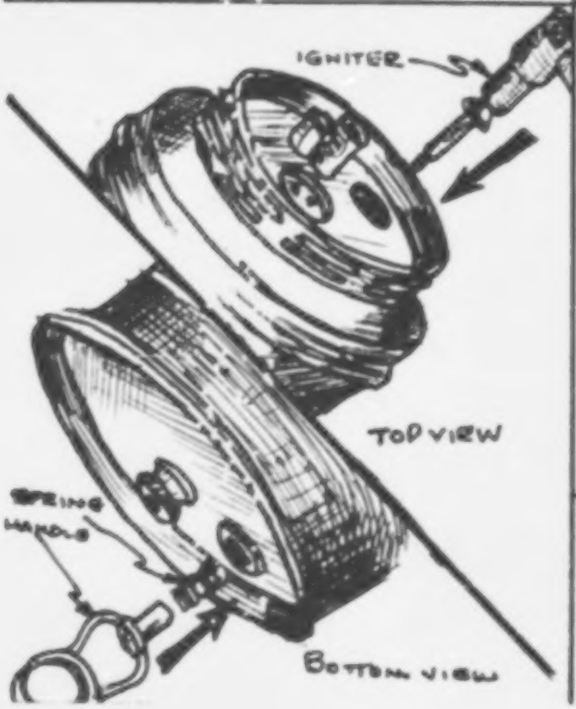
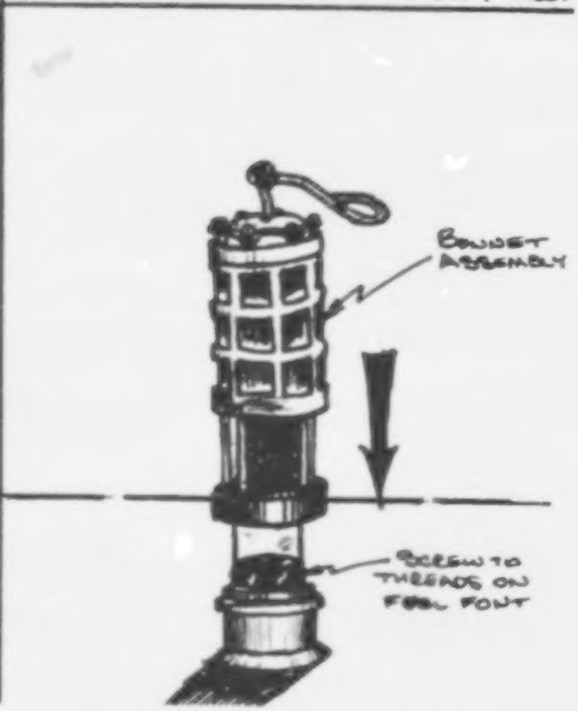


FIG. 12 SLIDING BONNET ASSEMBLY OVER THE GAUZES AND SCREWING IT INTO FONT ASS.



4) Place a gasket in the globe ring and put it over the globe.
5) Place the inner gauze on top of the globe ring.
6) Put the outer gauze over the inner gauze, making sure the seam on the outer gauze is on the opposite side from the seam on the inner gauze.
7) Take the bonnet assembly and put the expansion ring in by sliding it between the standards, not up through the bottom!
8) Slide the whole bonnet assembly down over the gauzes and screw the bonnet to the threads on the fuel font. Turn clockwise until tight. (While turning the bonnet, make sure the seams on the gauzes do not line up because the seams must be on opposite sides.) See fig. 12.
9. Listen for the click which indicates that the magnetic lock is locked.

Tightness Test

A test for proper tightness is to grab the globe with the thumb and first two fingers and turn. The globe should turn with resistance if it is properly tight. If it does not turn, the lamp is too tight. If it turns easily, the lamp is not tight enough. (Always wipe all fingerprints off the glass with a rag.)

Preliminary Test

After the safety lamp is assembled, it should be tested in a lamp testing box, which contains an explosive mixture of gas and air, before going underground.

1) Place the unlighted lamp in the box.
2) Operate the igniter while holding the lamp in the explosive mixture.
3) If the lamp is not safe, the spark will ignite the gas-air mixture in the box and break the paper diaphragm at the top of the box.

Possible Mistakes in Assembly

If the lamp did not pass the preliminary test, check for these errors:

1) Omitting or using broken gaskets.
2) Omitting or using a dirty or damaged gauze.
3) Using any dirty or damaged parts.
4) A loose fuel filler plug.
5) Omitting the expansion ring.
6) A loose fit between the globe and gasket due to not tightening the bonnet to the font.
7) Tightening the fuel font too much, destroying the usefulness of the expansion ring.
8) Using a distorted bonnet or shield.
9) Not carefully inspecting each part tosee that it is clean and in good condition.

Only after a lamp has passed the preliminary test can it be taken underground. Lives depend on it.

PROGRAM D-2 STUDENT NAME ________

UNIT 02 MODULE 04 TASK 050 INSTRUCTOR ________

DATE COMPLETED ________ INSTRUCTOR'S INITIALS ________

TASK TITLE: *Permissible Hand-held Methane Detector.*

Objective:

After studying the illustrations and the information sheet, the student will explain the Wheatstone Bridge Principle by answering all review questions correctly, and check six methane detectors (models 402, 502, 102, 100, Spotter and Bacharach) for battery charge, mechanical and electrical zero and test for methane gas by completing the chart to meet the instructor's approval.

Tools and Materials:

1. MSA Model 402
2. MSA Model 502
3. MSA Spotter
4. MESA Model 102
5. CSE Model 100
6. Bacharach Canary
7. Methane chamber

Procedure:

1. Read the objective at least twice.
2. Read and review information sheet.
3. Study the schematic drawing and illustrations.
4. Answer all review questions.
5. Check for battery charge, mechanical and electrical zero, test for methane in the chamber and complete the chart for the following methane detectors: MSA Models 402, 502 and Spotter, MESA 102, CSE 100 and the Bacharach canary.
6. Have instructor check chart.

Review Questions:

1. Are methane detectors the only gas detectors that use the Wheatstone Bridge Principle?

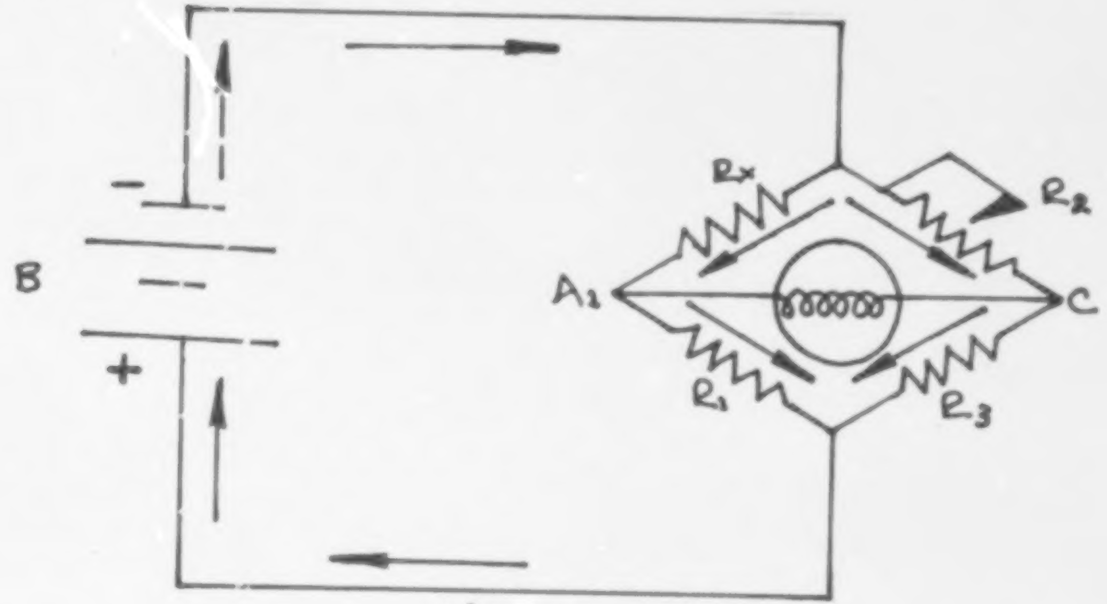
ISSUE 1 DATE 3/2/77 P 1 OF 10

REVIEWED & APPROVED RESEARCH ____ INSTRUCTOR ____ ADMINISTRATION ____

PREPARED BY: Mr. Ronald Bellock

PROGRAM D-2 UNIT NO.02 MODULE NO. 04 TASK NO. 050

2. Using the following schematic drawing, briefly describe the steps leading up to the unbalance of the bridge.



WHEATSTONE BRIDGE

188

3.

CHART OF METHANE DETECTION

MARK AN "X" IN EACH BOX AFTER COMPLETING THE CHECK. RECORD THE PERCENT OF METHANE DETECTED

METHANE DETECTORS	CHECK FOR BATTERY CHARGE	CHECK FOR MECHANICAL ZERO	CHECK FOR ELECTRICAL ZERO	PERCENT OF METHANE MEASURED
MSA MODEL 402				
MSA MODEL 502				
MSA SPOTTER				
MESA MODEL 102				
CSE MODEL 100				
BACHARACH CANARY				

INFORMATION SHEET

Section 75.307 of the Code of Federal Regulations requires tests for methane to be taken by qualified persons at the start of each shift, before energizing the equipment. If 1.0 volume per centum or more of methane is detected, no electrical equipment will be taken into that area and energized. Tests for methane will be made at least every 20 minutes during each working shift. Section 75.307-1 requires a methane test at the face of each working place during each shift and before any electrical equipment is taken in. A flame safety lamp is no longer considered an approved methane detector unless it is used along with another approved methane detector.

Those detectors approved and in use in mines include the MSA Models 402, 502, and Spotter, MESA Pocket Model 102, CSE Digital Model 100, and the Bacharach Canary:

They all operate on the basic Wheatstone bridge principle and measure zero to 5% methane.

Wheatstone Bridge Principle

Although it is mostly used for methane detectors, the wheatstone bridge principle will work with any combustiable gas.

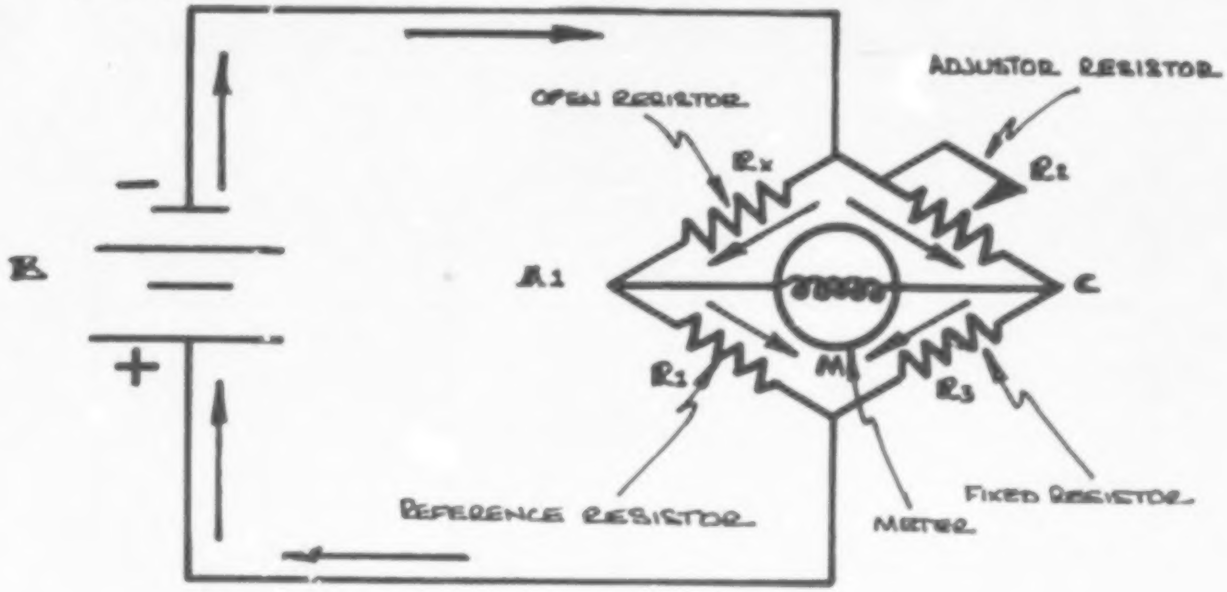


FIG.1 THE WHEATSTONE BRIDGE

R2- resistor used to adjust the meter (M) to read 0 when methane is not present.

R3- "the controlled resistor" or fixed resistor which has constant resistance and can not be changed under any condition.

R1- fixed resistor but will vary with the room temperature (or atmospheric temperature) to compensate for atmospheric effects on Rx.

Rx- open resistor which detects methane gas.

A1- balances with C and reads zero on M when methane is not present.

How the Wheatstone Bridge Operates:

When Methane is present ---

1. -- the electrical current from the open resistor (Rx) will burn the methane, which in turn causes Rx to become hotter ---

2. -- the heat from Rx causes side A1 to draw more electrical current ---
3. -- which creates an unbalance current between A1 and C ---
4. -- and the amount of unbalance is registered on the meter (M.)

Thus, as the amount of methane increases, the heat will increase and the meter will register higher.

MSA Model 402

The MSA M-402 methanometer is an electrically operated methane detector that measures the amount of methane gas in the mine air. See figure 2. It has four buttons: the "0-2 button" and "0-5 button" located on the right side near the top, the button on the lower left side which operates the pump, and the battery voltage button, marked "check", located above the pump button. See fig. 3. The meter face has two scales for reading the amount of methane. By pushing the 0-2 button, the upper scale shows reading for 0 to 2 percent methane. (Each line represents 1/10 of a percent. See fig. 4) By pushing the 0 - 5 button, the lower scale shows from 1.6 to 5 percent methane. (Each line represents 2/10 of a percent.) The red area shows there is higher than 5 percent methane.

FIG. 2

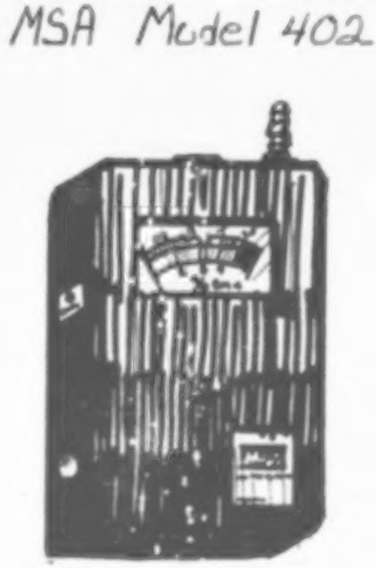

MSA Model 402

FIG. 3

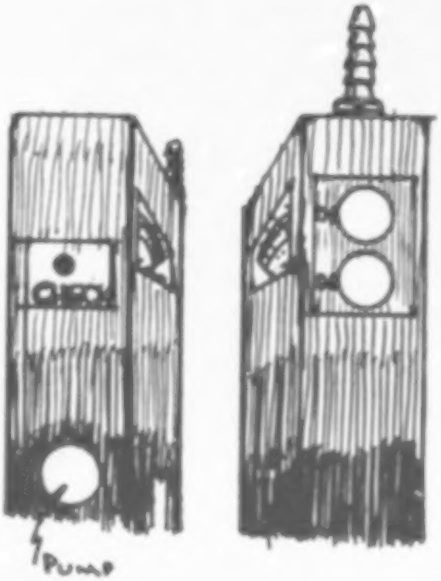
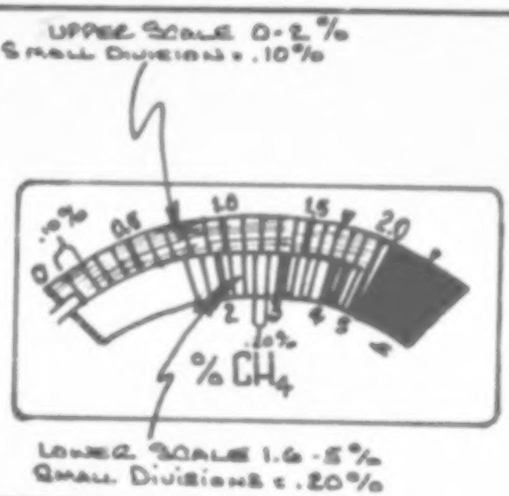


FIG. 4


UPPER SCALE 0-2 %
SMALL DIVISIONS = .10%
0
.10%
0.5
1.0
1.5
2.0
2
3
4
5
.20%
% CH4
LOWER SCALE 1.6 - 5 %
SMALL DIVISIONS = .20%

CHECKS:

1. Check Battery Charge - Press the pump button for three seconds to allow fresh air to enter, then release. At the same time, press the "0-2" button and the "check" button and if the battery is fully charged, the pointer will read in the red area.

2. Check for Mechanical Zero - Hold methanometer up-right and observe the position of the pointer. It should point to zero on the scale.

3. Check for Electrical Zero - Take in fresh air sample by pressing the "pump" button for three seconds, wait five seconds, then press "0-2" button. The pointer will move to the left and back, stopping exactly on the zero mark.

4. Test For Methane - Once these checks are made and the methanometer is operating correctly, a methane check can be made in the test area. With thumb of the right hand on either the "0-2" or "0-5" button and the third finger pressing on the pump button, hold for three seconds and release. Wait five seconds and press the measuring button again and read the matching scale; the "0-2" button records on the "0-2" scale and the "0-5" button on the "0-5" scale. The reading indicates the percent of methane in the air.

ADJUSTMENTS:

1. Mechanical Zero - With the methanometer in operating position, remove back cover with triangular screw driver and turn the adjusting screw until the pointer is over the zero. (See fig. 5)

2. Battery - Turn the triangular-headed screw marked "charge" to the right, hold it and slide the small cover on the bottom outward. Connect a charging cable to the methanometer and mono-battery charger and plug the charger into a normal 115 to 120 volt AC outlet. The lighted green lamp indicates that the charger is operating. If reading is:

1.7	charge for: 14 hours
1.8	11 hours
1.9	7 hours

3. Electrical Zero - Remove the back cover, hold "0-2" button down and adjust screw "0" with a small screw driver until pointer is over the zero on the scale.

4. Changing Filter - While holding methanometer upside down, unscrew the sample inlet fitting, remove old filter and insert clean filter.

MSA Model 502

The MSA M-502 methanometer is an electrically operated detector and indicator. It is about the size of a small transistor radio and has a dual scale range of 0-2%, and 1.6-5% full scale. (See fig. 6)

CHECKS:

1. Check Battery Charge - Press the battery test button (BT) located at the bottom left hand side of the methanometer face. If the battery is adequately charged, the pointer in the meter will swing full scale.

FIG. 5

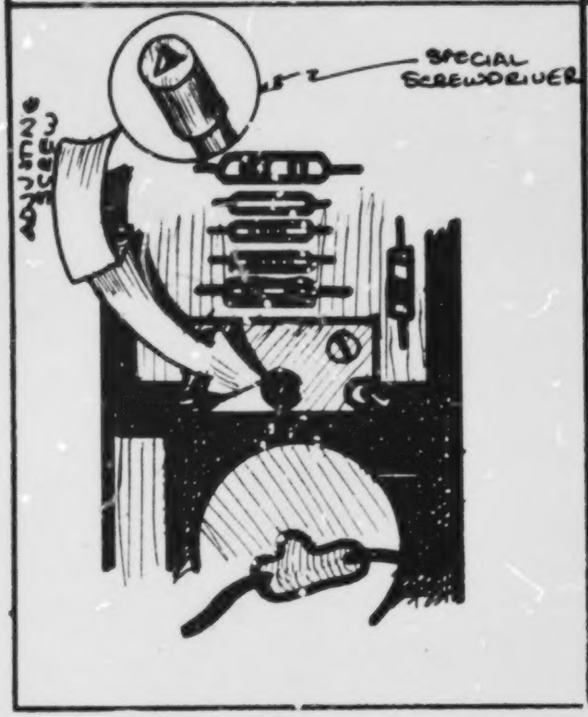
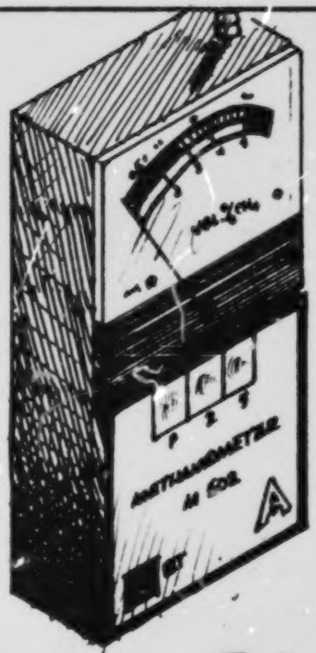


FIG. 6



MODEL 502

2. Check for Mechanical Zero - When the M-502 is held upright, the pointer should rest on zero.

3. Check for Electrical Zero - When the pump button, marked (P), is pressed, the pointer should swing full scale.

4. Test For Methane - Press test button (marked 2) and the pointer will indicate on the top scale the amount of methane measured. If 2% is read on the top scale, press the button 5 to calculate the total percentage of methane present as shown on the bottom scale.

MSA Permissible Methane Spotter
The MSA Methane Sootter is a portable, electrically operated detector which also measures zero - 5% methane. See Fig. 7.

CHECKS:

1. Check Battery Charge - Press Test and check buttons for 15 seconds. The pointer will move to the 5 mark and then return down scale and stop within the BATTERY area of the meter if the battery is charged.

2. Check for Mechanical Zero - When the MSA Spotter is held upright, the pointer should rest in the black area.

3. Check for Electrical Zero - In normal air, press Test Button for 15 seconds and the pointer should rest in the black area.

4. Test for Methane - Hold the spotter in the testing area with the left hand, press the Test Button with the left thumb for 15 seconds, and read. (If methane is detected above 5% the pointer will move upscale and then downscale.)

Fig. 7

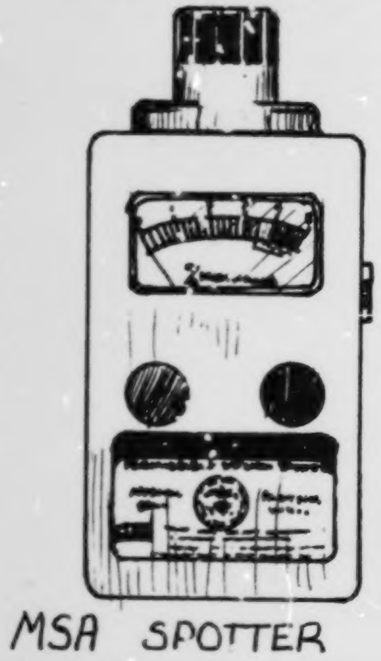
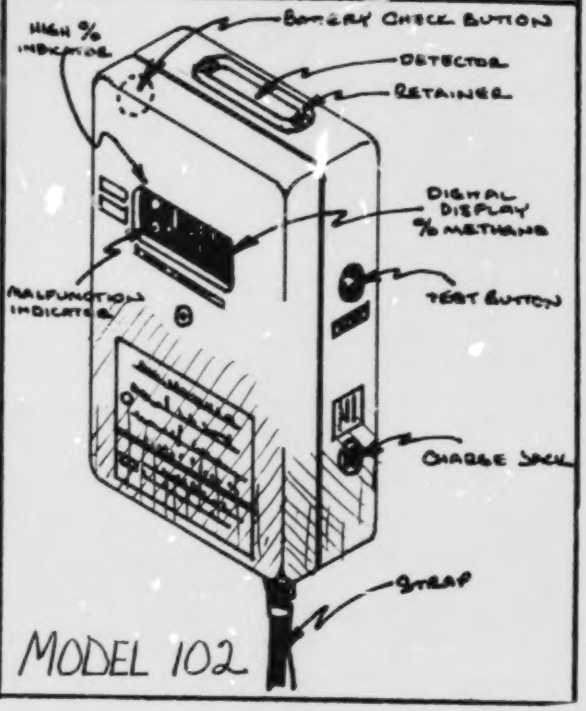

MSA SPOTTER

Fig. 8


HIGH % INDICATOR
BATTERY CHECK BUTTON
DETECTOR
RETAINER
DIGITAL DISPLAY % METHANE
MALFUNCTION INDICATOR
TEST BUTTON
CHARGE JACK
STRAP
MODEL 102

MESA Digital Pocket Size - Model 102

The MESA M-102 is a battery-powered, hand-held methane detector which reads zero - 5% in digital display by pressing the test button on the side. See fig. 8.

CHECKS:

1. Check Battery Charge - Press Test Button and Battery check switch for 15 seconds. If the battery is properly charged, the digits will read 2.4 to 4.5 volts.

2. Check for Electrical Zero - In fresh-air, press Test Button and 0.0 or 0.1 should appear in 7 seconds. If the MALF flashes, the detector head is not functioning. If the light stays on, the problem is in the main circuit board.

3. Test for Methane - Press and hold Test Button 7 seconds and note methane reading. Allow a minute to cool before retesting.

CSE Digital Hand Held-Model 100
The CSE M-100 is also a battery powered, hand-held digital methanometer measuring zero - 5% methane gas. See fig. 9.

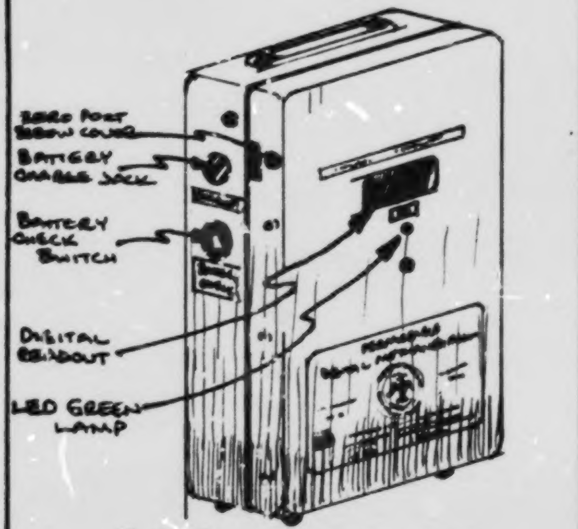
CHECKS:

1. Check Battery Charge - When the Test Button and Battery check switch are pressed, the digital should read 1.0 to 2.5 volts. The green LED lamp, below the digital display, indicates, by its brightness, the state of charge of the batteries.

2. Check for Electrical Zero - In fresh air, press Test Button and hold until digital display lights. It should read - 0.9, or 0.1, to be satisfactory.

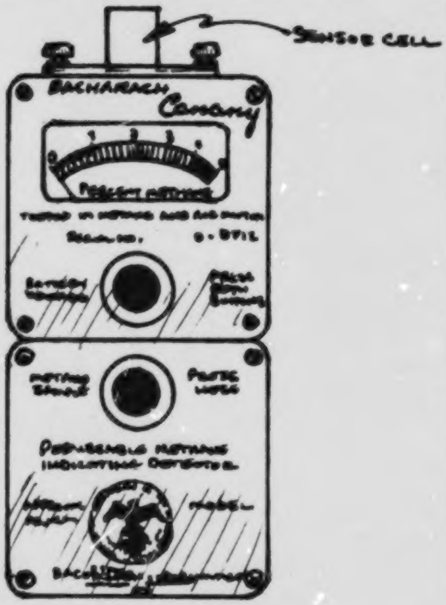
3. Test for Methane - Press Test Button and hold for about 20 seconds. Allow a minute to cool before making next test.

Fig. 9


ZERO POST SCREW COVER
BATTERY CHARGE JACK
BATTERY CHECK SWITCH
DIGITAL READOUT
LED GREEN LAMP

CSE MODEL 100

Fig 10


SENSOR CELL
BACHARACH
Canary
PERCENT METHANE
PERMISSIBLE METHANE INDICATING DETECTOR

BACHARACH CANARY

Bacharach Canary Methane Detector
The Bacharach canary is a portable, electrically operated instrument detecting methane from zero - 5%. It only weighs 1 pound. See fig. 10.

CHECKS:

1. Check Battery Charge - When the Battery Voltage Button and Test Button are pressed at the same time, the pointer should rest in the green area.

2. Check for Mechanical Zero - When the detector is held upright, the pointer should rest on zero.

PROGRAM D-2 UNIT NO. 02 MODULE NO. 04 TASK NO. 050

3. Check for Electrical Zero - If the pointer is in the green area, release the Battery Voltage Button while still holding the Test Button, and the pointer should return to zero in 10 to 15 minutes.

4. Test for Methane - Hold the Bacharach so the sensor cell is in the sampling region. Press the Test Button for 20 seconds and read the scale. (If methane is pegged up to 5%, remove hand immediately to avoid burning the inside of the instrument.)

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
STUDENT NAME ______
UNIT 03 MODULE 01 TASK 010
INSTRUCTOR ______
DATE COMPLETED ______
INSTRUCTOR'S INITIALS ______

TASK TITLE: *Federal Regulations - First Aid equipment, location and procedures.* (75.1713)

Objective:

After studying the material, the student will understand what first aid equipment is available underground, where this equipment is located and what arrangements have been made to aid the transportation and care of an accident victim, to the satisfaction of the instructor by answering the review questions accurately.

Procedure:

1. Read the objective three times.
2. Study the information sheet.
3. Answer the review questions.

Review Questions:

1. What responsibility has the mining company for first aid?

2. Where is underground first aid equipment located?

3. Name five pieces of equipment found in a first aid box.

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DATE 3/7/77
P 1 OF 2

REVIEWED & APPROVED RESEARCH MSH INSTRUCTOR JD ADMINISTRATION JMB

PREPARED BY: Mr. Alton Hewitt

INFORMATION SHEET

Federal law requires the mining company itself, to make arrangements for 24 hour care of accident victims. This care includes ambulance service, emergency communications (telephone, radio transmissions, etc.) with a hospital or clinic and first aid training programs for new workers.

Companies are also required to supply first aid equipment and locate that equipment in specific areas.

1. At the mine dispatcher's office or any area close to the mine entry.

2. At the bottom of a reqularly traveled slope or shaft if that slope or shaft extends more than 1000 feet from the surface.

3. At each working section not more than 500 feet from the face.

Federal law also lists the minimum amount of equipment at each location.

1. One stretcher
2. One broken back board (splint stretcher will satisfy both 1 and 2).
3. 24 triangular bandages.
4. 8 four inch bandage compresses
5. 8 two inch bandage compresses
6. 12 one inch adhesive compresses
7. One tube of an analgesic antiseptic
8. Two cloth blankets
9. One rubber blanket or equivalent
10. Two tourniquets
11. 1 ounce bottle spirits of ammonia or 12 ammonia ampules
12. Two inflatable arm and leg splints each or several rigid splints.

All first aid equipment must be stored in dust tight and moisture proof containers, when located underground. New workers should become acquainted with the location of this equipment. Remember, these laws only list the minimum of first aid equipment. Many mines have better equipped first aid centers than required by law. The worker should be aware of all the first aid equipment, he may use in an emergency.

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2 STUDENT NAME

UNIT 03 MODULE 02 TASK 010 INSTRUCTOR

DATE COMPLETED INSTRUCTOR'S INITIALS

TASK TITLE: *Types and Operations of Portable Fire Extinguishers.*

Objective:

After studying the information sheet and the class demonstration, the student will list the required locations of portable extinguishers in the mines and distinguish between the types of portable extinguishers by answering the review questions to 90% accuracy and operate the available extinguishers according to the instructions on them, quickly, properly and to the instructor's approval.

Introduction:

There are many types of portable fire extinguishers available to fight the various classes of fires. Since time is critical in an actual fire situation, every miner should know how to operate available equipment.

Reference:

Class discussion and demonstration.

Tools:

1. Stored pressure water extinguisher
2. Soda-acid extinguisher
3. Foam extinguisher
4. Dry chemical extinguisher
5. Carbon dioxide extinguisher
6. Nitrogen-cylinder - operated - dry - chemical - wheeled extinguisher
7. And any other available portable fire extinguisher

Procedure:

1. Read the objective twice.
2. Participate in class discussion and demonstration.
3. Study the information sheet.
4. Answer all review questions.
5. Following the instructor's demonstration and the directions on the extinguisher, operate all portable fire extinguishers available quickly, properly, and to the instructor's approval.

ISSUE 1 DATE 5/20/77 P 1 OF 6

REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. L. Thomas Gailey

Review Questions:

1. How are portable fire extinguishers classified?

2. When preparing to actuate a fire extinguisher, why be careful not to point the discharge at anyone?

3. List those places in the mines where federal law requires portable fire extinguishers.

4. Why is it important to always back away from a fire?

5. After a fire is detected, who should be notified as soon as possible?

INFORMATION SHEET

The best method for eliminating fires is prevent them from starting. But if the methods for fire prevention fail, methods for fire protection must be taken.

Types of fire protection tools include automatic sprinkler systems, fire hoses and portable firefighting equipment. Since many fires begin small, it is possible to extinguish them with the proper use of portable fire extinguishers. But regardless of the size, the section foreman should be notified immediately.

Federal law (75.1100) requires each mine to be provided with suitable firefighting equipment, established by the Secretary, according to the size and conditions of the mine.

All portable fire extinguishers must be either multipurpose dry chemical type or a foam producing type. Only fire extinguishers approved by the Underwriters Laboratories, Inc. or Factory Mutual Research Corp. are permitted to be used in the mines. Portable water and chemical cars must be of at least 1,000 gallons capacity or, in the case of a chemical car, equal to that. (75.1100-1)

There are two classes of portable fire extinguishers available for fighting mine fires; the hand-held type, which are easily handled by one person, and the mounted type, truck mounted for transportation to the fire area.

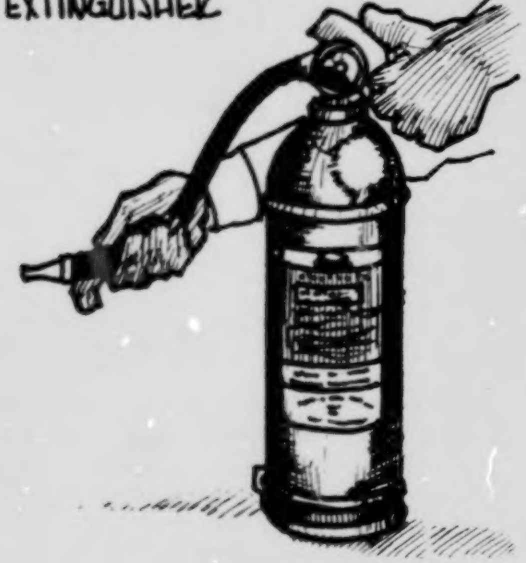
Hand Held Fire Extinguisher

Hand held extinguishers include anything from a bucket of water to soda-acid, foam, dry chemical or carbon dioxide types of extinguishers.

Water is the oldest and most popular fire extinguishing agent in use. Water is effective on Class A fires only, because it cools and dilutes the oxygen into vapor. Stored pressure water extinguishers usually hold about 2 1/2 gallon and are charged with calcuim chloride solution to avoid freezing. When the lever is squeezed, the expellant gas pushes the water up the discharge tube, through the hose and out the nozzle.

To operate: Pull the ring pin, grasp the nozzle, squeeze the lever and direct the stream at the base of the flame, using a side to side motion to wet all the burning surface. See Fig. #1. After using, turn the extinguisher upside-down and squeeze the lever until all the remaining pressure is released.

FIG. 1. STORED PRESSURE WATER EXTINGUISHER



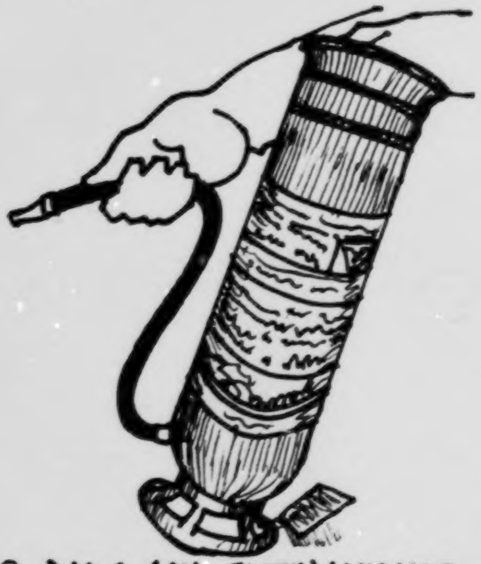


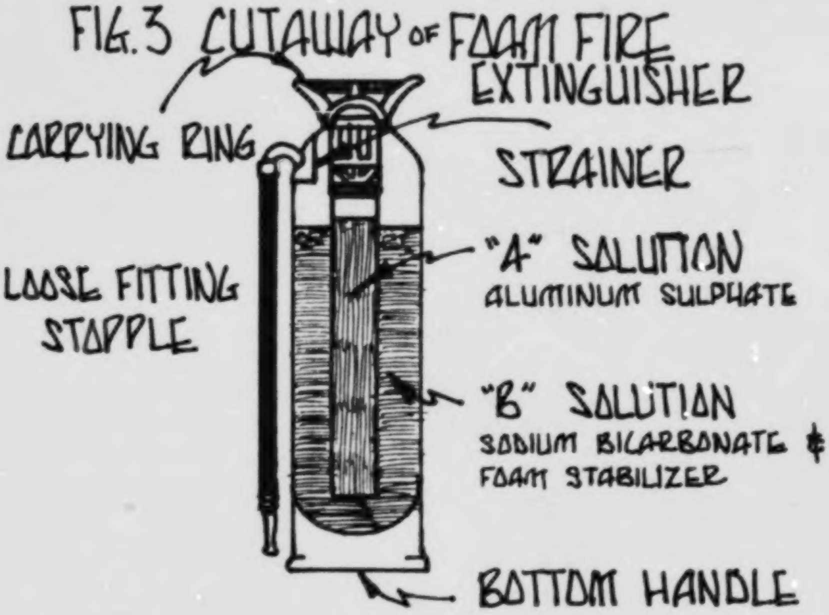
FIG. 2. SODA ACID EXTINGUISHER

The soda-acid fire extinguisher, although no longer being manufactured, is the type found in most public schools. Most of the container is filled with a water and bicarbonate of soda mixture and has a small open cup of sulfuric acid stored at the top. When the extinguisher is turned upside-down, the contents mix, forms carbolic acid and produces a pressure of about 100 lbs. per sq. in. The solution will squirt about 30 ft. These extinguishers contain only a few gallons, about 2 1/2, and are used on Class A fires only. Mounted extinguishers may hold 40 to 100 gallons and are used on larger blazes.

To operate: Hold with thumb and forefinger the hose near the nozzle, swing the nozzle upward, grasp the ring at the top with the same hand, while keeping a grip on the hose. Carry it by the ring; do not turn the extinguisher upside down until it is to be used. Hold the handle at the base with the free hand, invert it, and use. See Fig. #2.

The foam type extinguisher contains powdered aluminum sulfate, soduim bicarbonate, and a foaming ingredient which will cause a chemical reaction to shoot a foam stream about 50 ft. See Fig. #3. When the

FIG.3 CUTAWAY OF FOAM FIRE EXTINGUISHER


CARRYING RING
STRAINER
"A" SOLUTION
ALUMINUM SULPHATE
LOOSE FITTING STOPPLE
"B" SOLUTION
SODIUM BICARBONATE & FOAM STABILIZER
BOTTOM HANDLE

foam covers the fire, it cuts off the air, produces carbon dioxide and smothers the fire. Foam extinguishers are very effective on oil or gasoline fires but should never be used on electrical fires or uninsulated electrical cables.

To operate: Hold the discharge nozzle in one hand, turr the extinguisher upside down and direct the foam toward the flame.

Store-pressure, dry-chemical hand portable extinguishers contain a specially treated, water repellant, finely powdered material that is fluidized and free flowing when under expellent, or forced gas pressure. In stored pressure types the expellent gas and the powdered material are kept in a single chamber. A valve controls the discharge. When the operating lever is squeezed, the expellant gas forces the dry chemical up the discharge tube, through the hose and out the nozzle. See fig. #4.

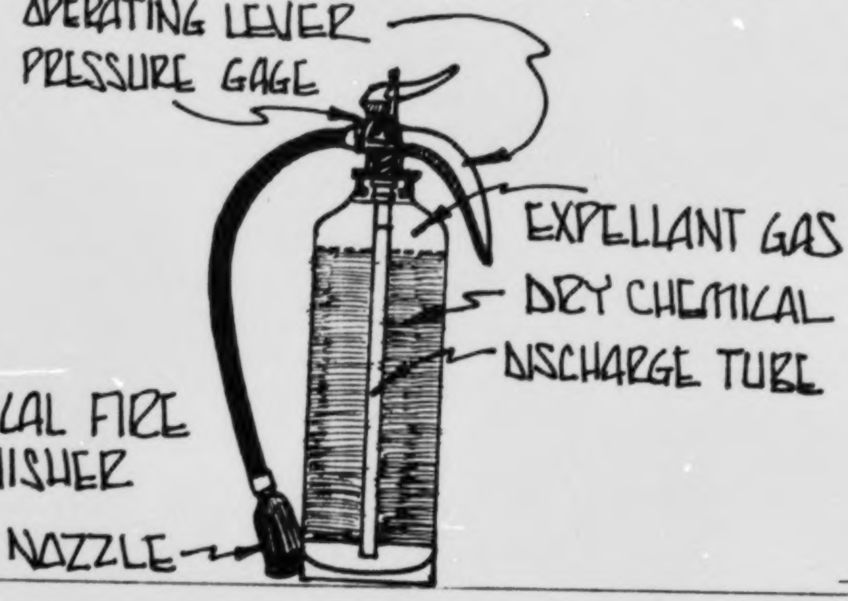

OPERATING LEVER
PRESSURE GAGE
EXPELLANT GAS
DRY CHEMICAL
DISCHARGE TUBE
NOZZLE

FIG.4
CUTAWAY OF DRY CHEMICAL FIRE EXTINGUISHER

Dry chemical extinguishers range from 1 to 30 pounds and can be used for Class A, B and C fires, depending on the extinguishing agent used. The smaller extinguishers have ranges of 5 to 8 feet and the larger, 5 to 20 feet.

To operate: Remove the ring pin. Remove the hose from the holder. Squeeze the operating lever and discharge at the base of the flame.

The carbon dioxide fire extinguisher consists of a steel cylinder of carbon dioxide liquid, a discharge valve, an insulated hose grip and a discharge tube. When the valve is opened, the liquid (which is under pressure) escapes and changes into a gas or a solid (carbon dioxide snow) and smothers the fire with a cold blanket of carbon dioxide. The carbon dioxide extinguisher should be used on B and C class fire and are not recommended by federal law because of the diluting effects of the ventilating air current.

To operate: Remove the ring pin, remove horn from the holder and hold it firmly. Squeeze the operating lever and direct the CO_2 stream toward the flame base. See fig. #5.

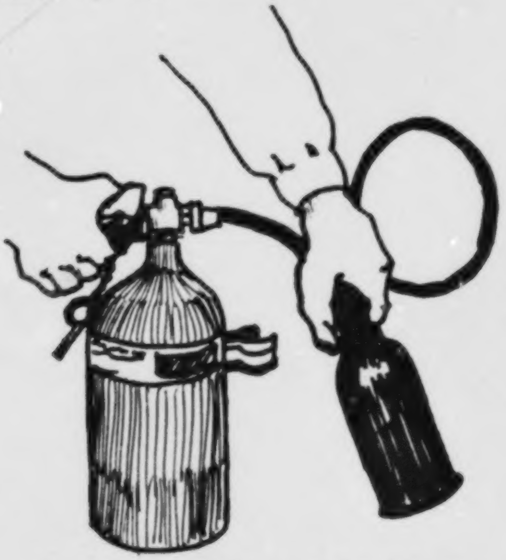


FIG.5 CARBON DIOXIDE EX

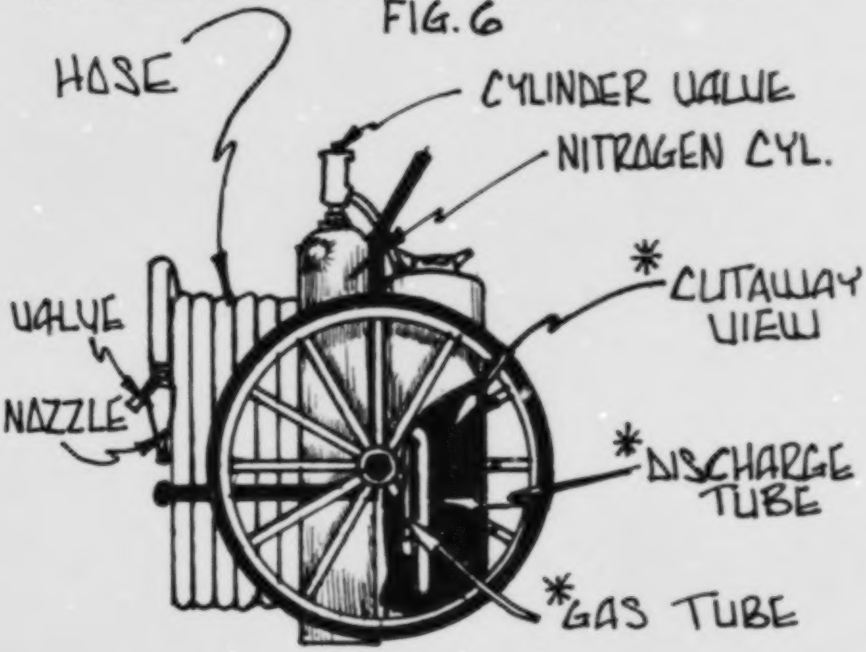
In a fire emergency, quickly read the main instructions on the body of the extinguisher to insure proper operation. Although this may take a few seconds, it might mean the difference between the extinguisher working correctly. EVERY MINER SHOULD BE FAMILIAR WITH THE TYPE AND OPERATION OF THE PORTABLE FIRE EXTINGUISHERS IN HIS MINE. If possible, use eye protection when using a fire extinguisher. When a fire is put out, always back away from it and watch for any flareup. Never turn one's back on a fire, even when it's assumed extinguished.

A miner should note where the fire extinguishers are kept, so in case of emergency, they can be easily located. Federal law (75.1100-2) requires at least two portable extinguishers and 240 lbs. of rock dust at each temporary electrical installation. Portable extinguishers must also be available at haulage tracks, oil storage stations and welding, cutting or soldering sites and on track or off-track locomotives, man-trip cars, personnel carriers and battery powered tractors.

Mounted Fire Extinguishers

Most mounted extinguishers are of the soda acid or foam types and rang from 75 to 250 pounds. Federal regulations require that only those that can be used for classes A, B and C fires, such as the nitrogen-cylinder-operated dry-chemical-wheeled extinguishers, be used underground. On the nitrogen-cylinder type, when the cylinder valve is open, the nitrogen pressurizes the dry chemical chamber. This forces the agent through the hose and up into the nozzle. By opening the operating valve, the amount of agent being discharged can be controlled. See Fig. #6.

NITROGEN CYLINDER EXTINGUISHER
FIG. 6



To operate: Hold the nozzle firmly. Making sure that operating valve is closed. Pull out the entire length of hose. Completely open the nozzle operating valve. Using a side-to-side motion, direct the stream at the base of the flames. After using, close the cylinder valve, turn the extinguisher in a upside down position and open the nozzle operating valve completely until all the remaining pressure is released. The extinguisher should be held in this position for at least 5 minutes.

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PROGRAM	D-2	STUDENT NAME	
UNIT 03 MODULE 02 TASK 020		INSTRUCTOR	
DATE COMPLETED		INSTRUCTOR'S INITIALS	

TASK TITLE: *Audio-Visual Fire Alarm System.*

Objective:

After studying the information sheet and illustrations, the student will define audio-visual fire alarm system, state it's functions and how it operates and answer all review questions with 75% accuracy.

Procedure:

1. Read the objective several times.
2. Read and review the information sheet.
3. Study the illustrations.
4. Answer all review questions.

Review Questions:

1. Explain the purpose of an audio-visual fire alarm system.

2. What does the system consists of?

3. Briefly describe how this system operates.

4. Briefly describe how to test and reset the alarm box.

ISSUE 1

DATE 2/15/77 P 1 OF 3

REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. Michael Most

PROGRAM D-2 UNIT NO. 03 MODULE NO. 02 TASK NO. 020

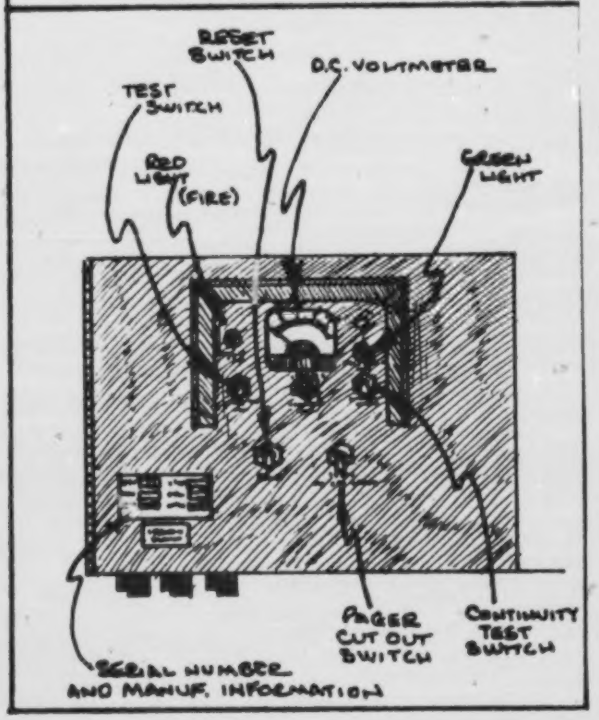
INFORMATION SHEET

Audio-Visual Fire Alarm System

The audio-visual fire alarm system is a means of alerting all areas in a mine in case of a fire outbreak on a belt and at the same time deenergizing the belt where the fire is located. This system consists of audio-visual fire alarm boxes installed at every belt drive (with at least one located at a noticeable spot outside the mine) and fire detectors installed about every 200' along the belt line (with the last one, located at the tail, having a diode connected across the circuit.)

The inside of the audio-visual fire alarm box contains an eight track tape player which, in case of a fire, automatically plays over the intercom system on all mine phones repeating the location of the fire until the fire is taken care of or the box manually switches off. Usually a female voice is taped because it is easily noticed. Since federal law (75.1103-1) requires a double check system, a red light on front of the box serves as a visual alarm. See fig. 1.

Fig. 1 Audio-Visual Alarm System Box.



After the fire is taken care of the box must be checked for continuity by switching the continuity tester located on the front of the box. The green light assures a complete circuit which indicates the system is in working order. When checking the battery, the meter must read 12 volts and 24 volts.

A fire detector, or fire sensor, as shown in figs. 2 and 3, is a pre-set open circuit device designed to close at a certain temperature, thus, completing the circuit and setting off the fire alarm. The fire alarm box does not reset when the circuit opens but must be reset manually on the box front.

Fig. 2. Sensor Rear View Positioned above Beltline.

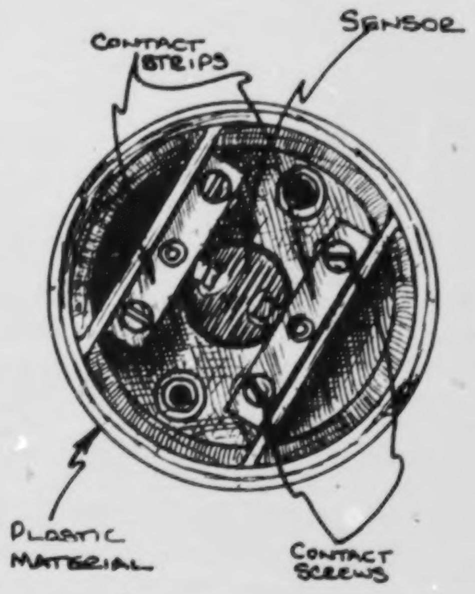
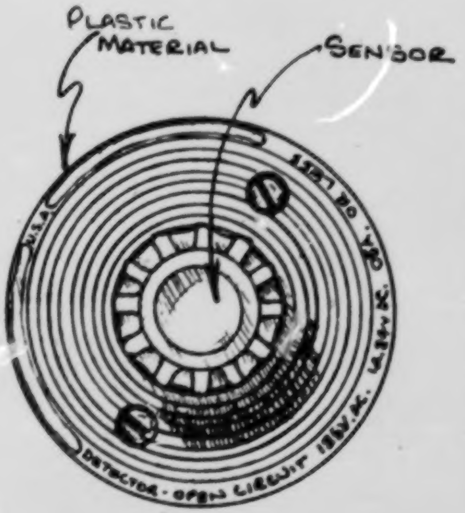


Fig. 3 Fire Det. Thermostat (Sensor) Front View



How This System Operates

When a fire breaks out along a belt line or heat builds up reaching a pre-determined temperature, the fire detector closes circuit thus completing the circuit and triggering off the fire alarm by relay, which simultaneously sets off the alarm light and tape player and shuts down the belt drive by opening the circuit and deenergizing the control circuit of the belt drive.

Basic Steps:

1. A fire breaks out or heat builds up to the pre-determined temperature ---
2. --- fire detector closes circuit completing the circuit and triggers off the alarm box ---
3. --- the alarm light turns on, the tape plays and the belt drive stops; all at the same time.

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EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2 STUDENT NAME

UNIT 03 MODULE 02 TASK 030 INSTRUCTOR

DATE COMPLETED INSTRUCTOR'S INITIALS

TASK TITLE: *Deluge Fire Control System.*

Objective:

After studying the information sheet and the illustrations, the student will define deluge system, state it's functions and how it operates and answer all review questions with 80% accuracy.

Procedure:

1. Read the objective several times.
2. Read and review the information sheet.
3. Study the illustrations.
4. Answer all review questions.

Review Questions:

1. Name the two functions of a deluge stystem.
2. What does the system consist of?
3. Briefly describe how this system operates.
4. Differentiate between the deluge water system, the deluge chemical system and the deluge foam system.
5. Which of these three systems is the most economical? Why?
6. What does the white light on the front of the control box indicate?
7. Where are the sprays located?
8. What function does the Audio-Visual Fire Alarm System serve?

ISSUE 1 DATE 2/21/77 P 1 OF 5

REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. Michael Most & Mr. Alton Hewitt

PROGRAM D-2 UNIT NO. 03 MODULE NO. 02 TASK NO. 030

INFORMATION SHEET

The deluge fire control system is an automatic multiple spray system designed to put out fires which may break out along the belt drive unit covering the area from the first heat roller extending back about 50', and to alert the troubled area. (Federal Register 75.1101). The system consists of a strip detector located over the drive roller at the head, an alarm box which sits in a noticeable, central location and a solenoid valve either on the main pipe connected to the water system (if a water spray is used), on the portable dry chemical tank (if a dry chemical spray is used) or on the foam generator (if a foam spray is used). Most mines spray water since it can be conveniently tapped into the deluge system from the water pipe along the belt lines. When water is not available, dry chemicals stored in tanks are sprayed, but this method is very expensive and the tanks must be replaced after each use. The foam system, which sprays a soap-like foam, is also expensive and tends to be messy in some cases.

The strip detector, or thermistor strip, is a fairly thin wire suspended over the drive rollers and connected to the control box which will detect a predetermined heat and activate the control box.

The control box, or alarm box, located near the belt starter box, or any other noticeable spot, serves as an audio-visual alarm to that area and activates a solenoid valve which diverts the spray, either water or chemical. When a strip detector detects abnormal heat, the control box simultaneously switches on a red light (visual alert) and a buzzer (audio alert) located on front of the box and electrically activates the solenoid valve which lets the water or chemicals spray the fire out.

The cellenoid valve is located on the main pipe connected to that water system or onto the dry chemical tank, depending on which deluge system is being used. In the case of the dry chemical spray, the tank will run until emptied and then must be replaced with a new tank. The water spray system must be manually reset at the control box after use. A white light on the front of the box indicates trouble with the deluge system itself.

How This System Operates

When a fire breaks out along the belt line or heat reaches the predetermined temperature, the strip detector will detect this abnormal heat and by resistance, will activate the control box which simultaneously shuts down the belt drive, switches on the red light and buzzer and activates the solenoid valve to open and allow the water or dry chemicals to flow into the deluge system and spray out the fire. The sprays are spaced so the system covers the top and bottom belts, the motor, the speed reducer, belt and drive rollers and all areas of the belt drive.

Basic Steps:

1. A fire breaks out or heat reaches the predetermined temperature ---
2. -- the strip detector activates the control box ---
3. -- the control box shuts down the belt drive, turns on the red light and buzzer and activates the celluloid valve --

4. -- the solenod valve opens and allows the water or chemicals to enter and spray.

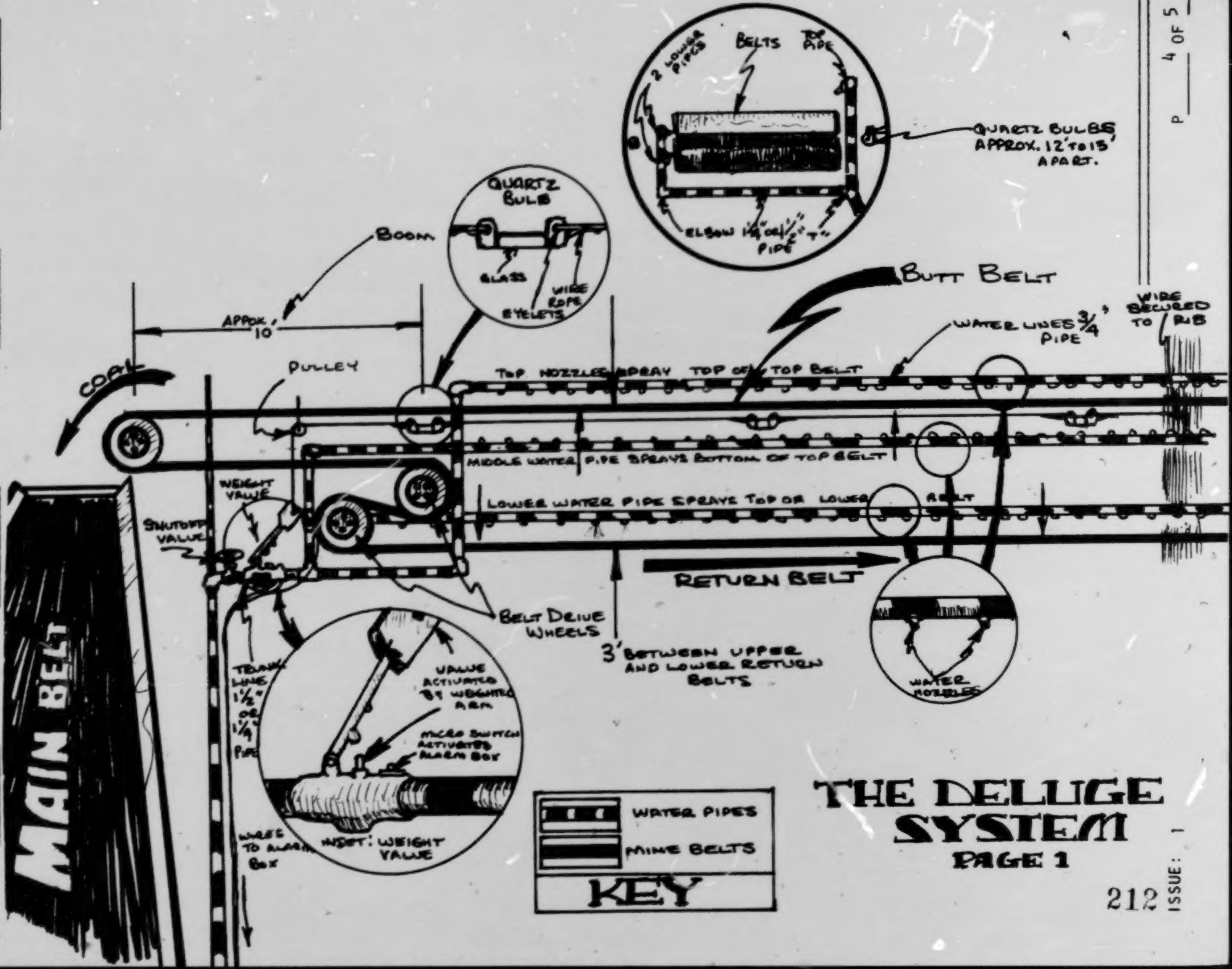
Some mines prefer to keep the belt moving to avoid the belt burning into two.

Often the deluge system uses a automatically activated weight valve in place of the electrically activated solenoid valve. Whenthe sensor detects abnormal heat, the fuse link, or quartz link, separates, causing the weight arm to fall, thus opening the valve and allowing the spray to flow. (See page 1 and 2 of illustrations.)

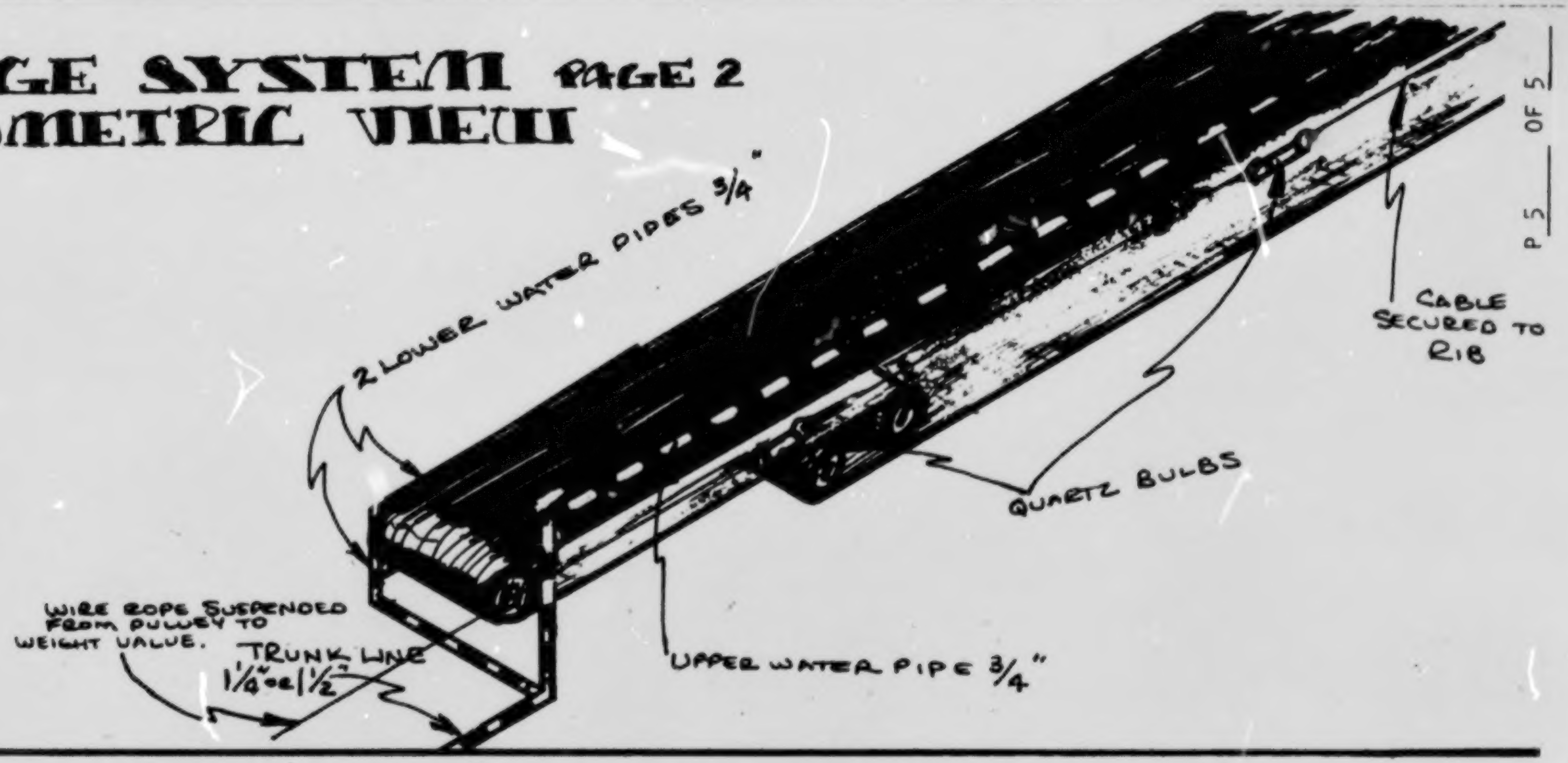
The Deluge Fire Control System works together with the Audio-Visual Fire Alarm System also installed in the mine. The Deluge system alerts the troubied area and sprays the fire out while the Audio-Visual Alarm system alerts all parts of the mine.

THE DELUGE SYSTEM

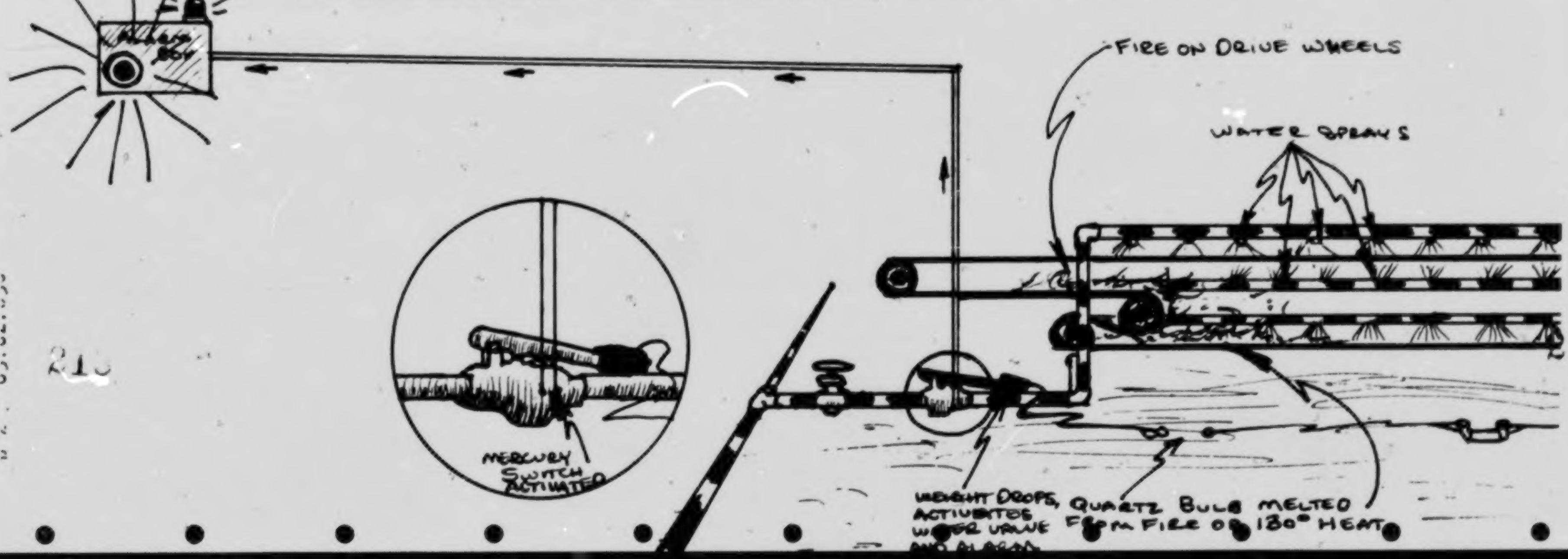
PAGE 1


2 LOWER PIPES
BELTS
TOP PIPE
QUARTZ BULBS APPROX. 12' TO 15' APART.
ELBOW
1½" OR 1½" PIPE
"T"
QUARTZ BULB
GLASS
EYELETS
WIRE ROPE
BOOM
APPROX 10'
BUTT BELT
WATER LINES ¾" PIPE
WIRE SECURED TO RIB
COAL
PULLEY
TOP NOZZLES SPRAY TOP OF TOP BELT
MIDDLE WATER PIPE SPRAYS BOTTOM OF TOP BELT
LOWER WATER PIPE SPRAYS TOP OF LOWER BELT
WEIGHT VALVE
SHUTOFF VALVE
MAIN BELT
RETURN BELT
BELT DRIVE WHEELS
3' BETWEEN UPPER AND LOWER RETURN BELTS
WATER NOZZLES
TRUNK LINE 1½" OR 1¼" PIPE
VALVE ACTIVATED BY WEIGHTED ARM
MICRO SWITCH ACTIVATES ALARM BOX
WIRES TO ALARM BOX
INSET: WEIGHT VALVE
WATER PIPES
MINE BELTS
KEY

DELUGE SYSTEM PAGE 2
ISOMETRIC VIEW


2 LOWER WATER PIPES 3/4"
CABLE SECURED TO RIB
QUARTZ BULBS
WIRE ROPE SUSPENDED FROM PULLEY TO WEIGHT VALVE.
TRUNK LINE 1 1/4" OR 1 1/2"
UPPER WATER PIPE 3/4"

DELUGE SYSTEM IN ACTION


ALARM BOX
FIRE ON DRIVE WHEELS
WATER SPRAYS
MERCURY SWITCH ACTIVATED
WEIGHT DROPS, ACTIVATES WATER VALVE AND ALARM
QUARTZ BULB MELTED FROM FIRE OR 180° HEAT

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PROGRAM D-2	STUDENT NAME
UNIT 03 MODULE 02 TASK 040	INSTRUCTOR
DATE COMPLETED	INSTRUCTOR'S INITIALS

TASK TITLE: *Self-Rescue Respirators.*

Objective:

After studying the material, the student will describe the uses of a self rescuer; the operation of a self rescuer and it's limitations to the satisfaction of the instructor. The student will also demonstrate the use of a self-rescuer and answer all review questions accurately.

Materials:

1. A permissible self-rescuer
2. Bucket of warm water
3. If available, a carbon monoxide chamber

Procedure:

1. Reread the objective.
2. Study the information sheet.
3. Answer the review questions.

Review Questions:

1. When should the worker use the self-rescuer?

2. How long will the self-rescuer protect the worker?

3. How should the worker check the self-rescuer?

4. If the self-rescuer does not come completely out of the container, what should be done?

5. What should be done if the self-rescuer gets hot when in use?

6. After the worker has put on the self-rescuer, what should he do next?

ISSUE 1 DATE 2/21/77 P 1 OF 4

REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. Ronald Bellock

7. When should the worker remove the self-rescuer?

8. How often can the self-rescuer be used?

9. If not used, how long will the self-rescuer be effective?

10. Should the self-rescuer be used when fighting fires?

INFORMATION SHEET

The presence of carbon monoxide within the mine is dangerous and the precautions taken save lives. Carbon monoxide is a poisonous gas generated by mine fires or explosions and since the gas is colorless and odorless, the worker has no warning of its presence. (For details see Task Sheet concerning Mine Gases.)

The device required by federal law 75.1714 to protect miners from carbon monoxide poisoning is called a self-rescuer because it was designed only to aid the worker in escaping from the gas. The self-rescuer is small and light, so it is generally attached to the worker's belt. The device is protected by a metal or plastic container. (The MSA W-65 model is also airtight and should be checked occasionally for leaks by placing it under water. If any bubbles appear, the seal is not airtight and the self-rescuer should be discarded. Other models may also be tested in this manner; but read the instructions supplied with the rescuer to be sure, since some self-rescuers are not waterproof.)

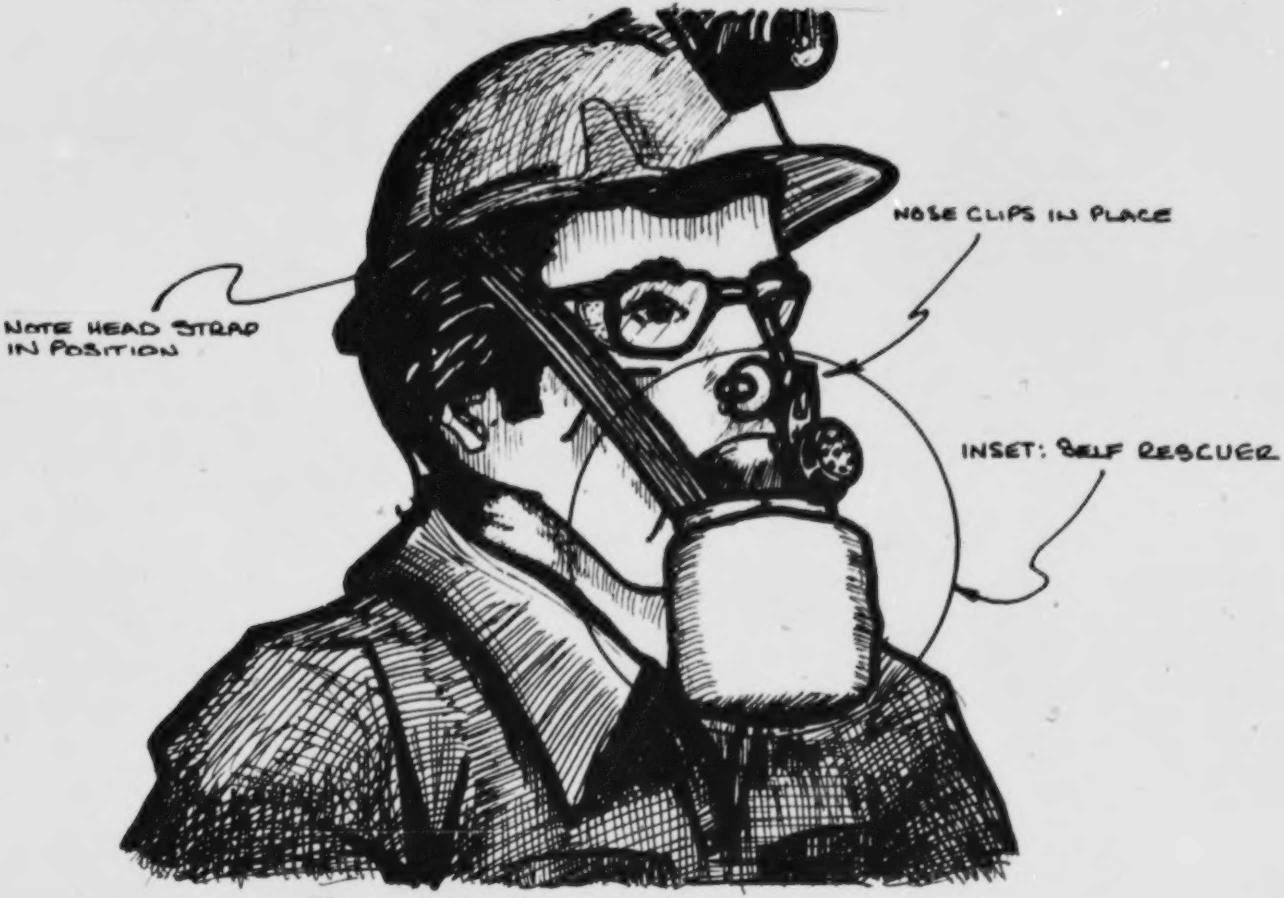
Before entering the mine, the worker should check his self-rescuer for any visible cracks or dents. If the case is dented, the worker may not be able to remove the self-rescuer completely from the container. However, the self-rescuer may still be used because there is enough space between the container and the filter to permit normal breathing.

At the first warning of a mine fire or explosion in a section nearby, the worker should not hesitate to use his self-rescuer and escape. Do not wait to see smoke since carbon monoxide may come before the smoke and it cannot be seen.

To use the self-rescuer follow these basic steps:

1. Break the seal by lifting the tab with your thumb.
2. Remove the cover.
3. Take the self-rescuer completely out of the container. (If it will not come completely out, you may still use the self-rescuer.)
4. Bite the rubber tips of the mouthpiece gently and make an airtight seal with your lips around the mouthpiece.
5. Pinch you nostrils shut with the nose clip.
6. Place the head strap over your head.

7. Replace your safety hat.
8. Breathe only through the self-rescuer.
9. Go to fresh air immediately.



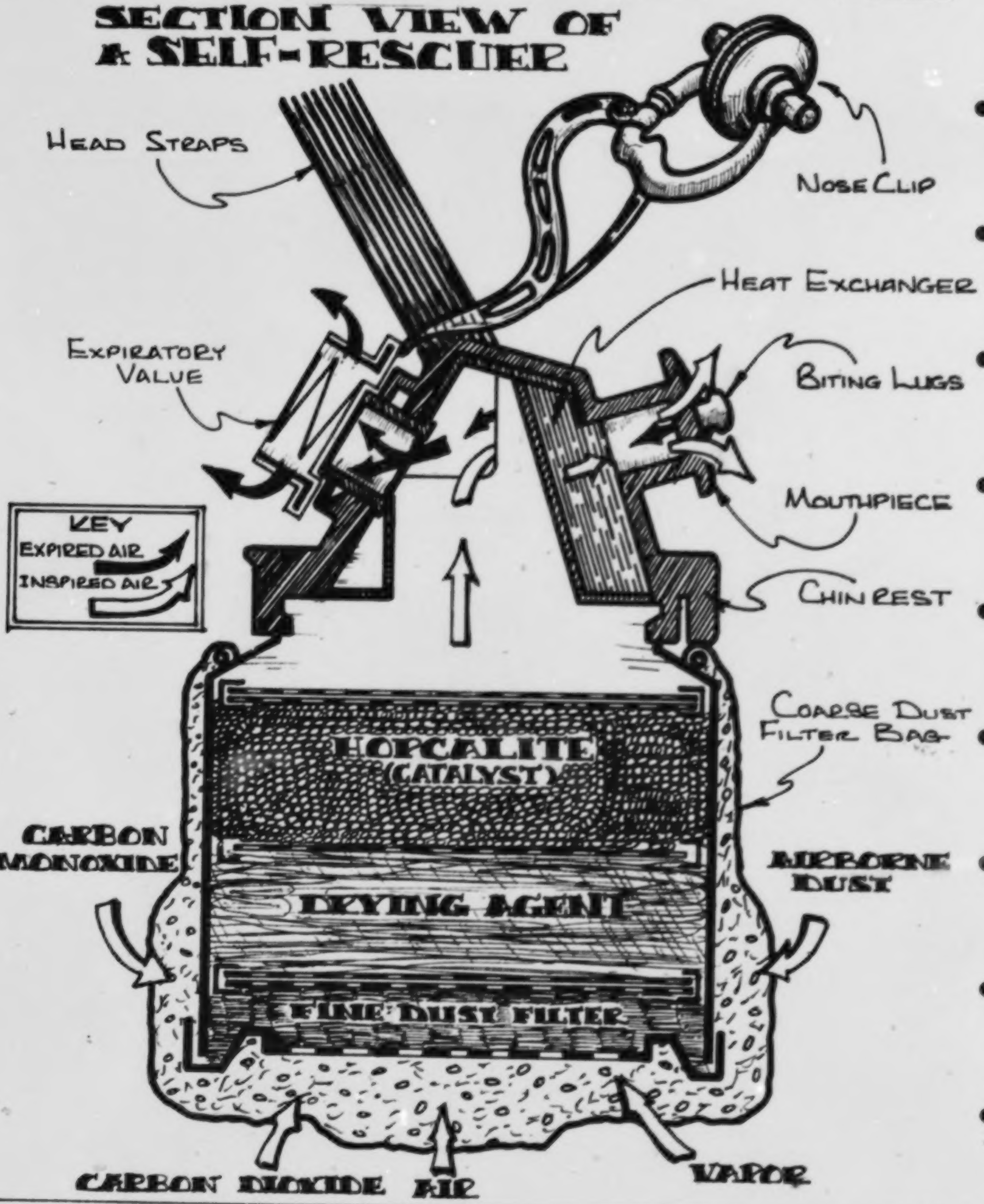
SELF-RESCUER IN POSITION

The self-rescuer contains a chemical (hopcalite) which changes carbon monoxide into harmless carbon dioxide. The rescuer can only be used as protection from carbon monoxide and cannot be used to protect the worker from any other gases. Hopcalite reacts with the carbon monoxide and this reaction will cause the self-rescuer and the breathable air to get hot. Don't remove the self-rescuer under any conditions, until you are safe. A drying agent is also contained in the self-rescuer to keep the hopcalite useful longer and a heat exchanger will help lessen the heat buildup in the unit.

When in an atmosphere of 1% carbon monoxide the rescuer will provide protection for only one hour. Higher levels of carbon monoxide lessens the time that a worker can be protected. This small amount of time should be used to escape and not to perform any other task.

The self-rescuer can only be used once. After the seal has been broken, the self-rescuer must be discarded. If the unit has not been used, it will last an average of five years and then must be replaced. If properly treated and used, the self-rescuer may save your life.

SECTION VIEW OF A SELF-RESCUER


Head Straps
Nose Clip
Heat Exchanger
Expiratory Value
Biting Lugs
Mouthpiece
KEY
Expired Air
Inspired Air
Chin Rest
Coarse Dust Filter Bag
Hopcalite (Catalyst)
Carbon Monoxide
Airborne Dust
Drying Agent
Fine Dust Filter
Carbon Dioxide
Air
Vapor

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
STUDENT NAME
UNIT 03 MODULE 02 TASK 050
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *Emergency Procedures When Trapped or Pinned.*

Objective:

After studying the information sheet, the student will list some symptoms of a mine emergency, explain the procedure to follow in the event of an emergency and describe how to construct a barricade by answering review questions to 90% accuracy.

Procedure:

1. Read the objective at least twice.
2. Study the information sheet.
3. Answer all review questions.

Review Questions:

1. List at least five signs that would indicate that an emergency had occurred in the mine.
2. Where are mine maps located?
3. Briefly explain the procedure followed when attempting to escape.
4. Briefly discuss some important factors to consider when selecting a barricading site.
5. What size area is needed to provide enough oxygen for 5 men for 37 hours?
6. How is the respirable air maintained in an area?
7. What is the purpose of a temporary barricade? How is it constructed?

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DATE 6/3/77
P 1 OF 4

REVIEWED & APPROVED
RESEARCH
INSTRUCTOR
ADMINISTRATION

PREPARED BY: Mr. Louis Christoff

8. What information should be written on the outside of both the temporary and permanent barricades?

9. Briefly describe how to construct a permanent barricade.

10. What actions should be taken after the permanent barricade is erected?

INFORMATION SHEET

The key prerequisites for survival during a mine emergency are: recognizing an emergency, following the procedures and remaining calm.

Recognizing An Emergency

Sudden changes in ventilation, blasts of air, clouds of dust or smoke, the odor of contaminants, an emergency alarm, such as a stench, visual or audible warning system, or the interruption of normal procedures may be an indication that a mine fire, rockfall or explosion has occurred.

Escape Procedures

In the event of an emergency, all persons in that area must be notified immediately and an accurate report of the situation must be phoned into the mine officials.

Immediately go to a predesignated assembly area. (Take your lunch bucket.) The self-rescuer, which provides protection against carbon monoxide that may be present after a fire or explosion, and the flame safety lamp, which can be used to test for sufficient oxygen, are especially important. Do not remove the self-rescuer, especially if it becomes warm or uncomfortable from heat as this indicates carbon monoxide converting into carbon dioxide. Removing the self-rescuer would mean quick death.

If communication can not be established with the mine officials, a cool headed experienced miner should take charge and explain the procedures to be followed and the alternatives available for escape. Federal law 75.1704 requires at least two separate and distinct travelable passageways, one which is ventilated with intake air, from each working section to the surface escape drift, shaft or slope opening. Strict federal laws demand escapeways to be large enough so all persons, including disabled persons, can quickly and easily escape in the event of an emergency. Escape facilities such as cages, buckets, stairways, ladders, etc., must be maintained in good condition. According to federal law 75.1704-2, an up-to-date map of the mine showing the main escape system must be conveniently located for all miners, and a map showing designated escapeways from the working section to the main escape route must be posted in each working section.

Once primary and secondary escape routes are chosen, the miners should attach themselves to one another by means of a rope or by holding onto the belt of another miner so individuals are not separated from the group while attemping to escape. Self-rescuers must be worn.

The lead man should scout the primary escape route first, checking for oxygen deficiency and dangerous gases. A second man should follow the lead man, keeping in seeing distance in case the lead man needs assistance. Last, following in the rear, is the main body. If the primary route can not be used, a secondary route must be attempted in the same manner.

Barricading Procedures

If both escape routes can not be used, the next attempt should be to build a barricade. Any materials useful for construction of a barricade should be gathered and taken to an area that is a reasonable distance from the disaster, preferably with a slight upgrade rather than a dip or low area to prevent the accumulation of water and dangerous gases. Try to find an area which will need as few stoppings as possible to seal it. A 10 ft. x 10 ft. x 10 ft. area will provide enough oxygen to support one individual for 37 hours. The number of men will determine the size of area to be barricaded.

Keeping the respirable air in that area and the harmful gases out is the next problem. This can be solved with short-circuiting the ventilation by opening doors or destroying stoppings.

Until sufficient time is allowed for building a permanent barrier, a temporary barricade should be built by hanging brattice material across an entry. Make this as airtight as possible by using mud or the like to plug spaces where air might be able to pass. The date, time and number of men behind the barricade should be written on the outside of the barricade so the rescue team can be properly prepared with materials and equipment when the barricade is opened.

After the ventilation has been short-circuited and the temporary barriers tightly constructed, time is available to build a permanent barricade. A permanent brattice can be built from cement blocks, using debris as backfilling. To make the stopping airtight, cracks and holes can be filled with mud. The date, time and number of men should be written on the outside also. If available, use chalk to draw arrows pointing towards the barricade.

After a permanent barricade is up the miner in charge should gather all food and water for rationing. Men should be assigned to take turns walking throughout the barricaded area to stir up the air, keep the men spaced apart and check each man's condition. Everyone else should stay quiet to conserve oxygen. Turn all cap lights out except one. The brattice should be inspected regularly for leaks.

Signaling is the best method of establish communication. Listen for 3 shots, then signal by pounding hard 10 times, rest 15 minutes and repeat the signal until 5 shots are fired, which means you are located and help is on the way. Only the mine rescue team should open the barricade.

PROGRAM D-2 UNIT NO. 03 MODULE NO. 02 TASK NO. 050

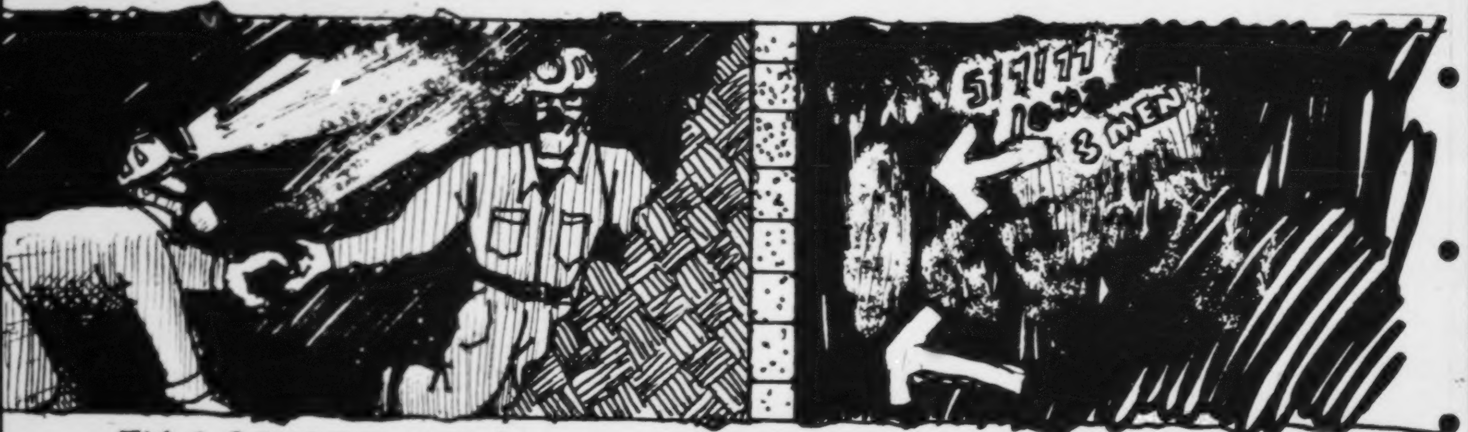

FIG.1 CONSTRUCTING A PERMANENT BARRICADE

As difficult as it may be, do not panic. At all times remain calm. The increased rapid breathing and adrenalin flow caused from fear, panic or hysteria is not only dangerous to one's emotional and physical health, but it uses up more valuable oxygen from the air. Thinking may become confused and hazy when in a panic state. It is important to maintain a clear head and a relaxed physical and emotional state.

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EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
STUDENT NAME
UNIT 03 MODULE 03 TASK 010
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *Basic First Aid Procedures.*

Objective:

After studying the material, the student will explain the reasons and basic methods of applying first aid to the satisfaction of the instructor by answering all review questions accurately.

Introduction:

All deep mines must deal with limited space and light, mine gases, electrical equipment, explosions and fires. For these reasons, coal mining is dangerous work. Careful attention to safety will help prevent accidents. However, if an accident does occur, a worker should be able to help himself and other workers. Practicing safety is the best skill a miner can learn, but in the event of an accident, knowing first aid is just as important.

Procedure:

1. Reread the objective.
2. Study the information sheet.
3. Answer the review questions.

Review Questions:

1. What is first aid?
2. If an accident victim says he is alright, should he continue working? Why?
3. What order should the rescuer use when treating injuries? Name all six steps!
4. Explain the importance of the rescuers attitude.
5. In addition to the treatment of the victim's injuries, what else should a rescuer or first aid team do?

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P 1 OF 2

REVIEWED & APPROVED
RESEARCH MSK
INSTRUCTOR
ADMINISTRATION

PREPARED BY: Mr. Alton Hewitt

INFORMATION SHEET

First Aid is only temporary assistance for an accident victim. First aid treatment is never a substitute for professional medical help. However, it is not likely that professional medical help will be available at the scene of a mine accident. But if first aid is started quickly and properly, it may save a victim's life and prevent any further injury.

There are several basic reasons for applying first aid:

1) to maintain life.
2) to prevent further injury to an accident victim.
3) to protect the injuries from further complications.
4) to prevent pain and make the victim as comfortable as possible.
5) to transport the victim to professional medical assistance (if necessary) and without further damage to the victim's injuries.

Federal Law (75.1713) requires that training programs in first aid be conducted regularly within the mines. The importance of these first aid training programs cannot be stressed enough. Records show that mines with complete first aid training programs have less injuries and workers properly trained in first aid are very safety concious.

However, if an accident does occur, some basic rules of first aid must apply.

1. Don't panic! The rescuer should react quickly and calmly.
2. The accident victim is going to be scared and possibly aware of how badly he is injured. Often, the best first aid is simply a few reassuring words.
3. Send for help. An organized first aid team will get an ambulance to the mine entrance (if necessary), notify the proper officials of the accident's location, find transportation from the section and give proper treatment to the victim.
4. Be confident! If you work quickly and evenly, you will be more help to your victim.
5. Check the condition of your victim.
6. Apply first aid to the worst injuries first.
    a) breathing - any difficulty in breathing must be quickly corrected.
    b) bleeding - any severe external or internal bleeding must be stopped or controlled.
    c) treat your victim for shock.
    d) treat all broken bones and burns.
    e) treat all other specific injuries.
    f) transport your victim to the nearest medical center.

Some of the more hazardous effects of an accident cannot be seen. Any accident victim should be checked by a doctor. (Even though the injury does not look very serious.) Report any accident to a foreman and don't permit a worker to continue working until he has been checked by a qualified person.

*In all remaining first aid related task sheets, it may be necessary to have a complete mine first aid station available for the students use.

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2

STUDENT NAME

UNIT 03 MODULE 04 TASK 010

INSTRUCTOR

DATE COMPLETED

INSTRUCTOR'S INITIALS

TASK TITLE: *First Aid treatment for impaired breathing.*

Objective:

After studying the material, the student will demonstrate and explain the methods of giving artificial respiration to the satisfaction of the instructor. The student will also answer the review questions to 100% accuracy.

Introduction:

Any interruption in the breathing process puts a strain on all our activities and could result in death. After breathing has stopped, the brain will continue working for four to six minutes. During this time, the breathing process may be started again. (However, the longer the brain does without oxygen, the greater the chance of brain damage.) The method used to start the breathing process after it has failed is called artificial respiration.

Procedure:

1. Reread the objective.
2. Study the information sheet.
3. Demonstrate and explain artificial respiration.
4. Answer all review questions.

Review Questions:

1. How long does the brain function after the breathing stops?

2. Explain the Heimlich Maneuver!

3. If a rescuer finds an unconcious victim, what should the rescuer do before beginning artificial respiration?

4. Describe several methods of opening a complete airway.

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REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. Alton Hewitt & Mr. James DeHaven

5. How can the rescuer be sure that an airway is open?

6. How many breaths per minute should a rescuer blow into an adult victim's lungs?

7. How long should a rescuer continue artificial respiration?

8. Name four common mistakes made by a rescuer when performing mouth-to-mouth resuscitation.

INFORMATION SHEET

Any interruption of the breathing process is the most serious accident that may occur. For this reason, treatment of a breathing problem is the first duty of a rescuer. If the rescuer does not act quickly, the victim may die long before a doctor can get to the scene of the accident.

The most common breathing problem is caused by an object stuck in the victim's throat (food, gum, etc.). The victim may gag, become faint and the skin will become pale. Since the victim may reach for the upper chest or neck, this condition is often confused with a heart attack. If the rescuer sees the victim in this condition, the rescuer may avoid a more serious condition with a very simple action: the Heimlich maneuver.

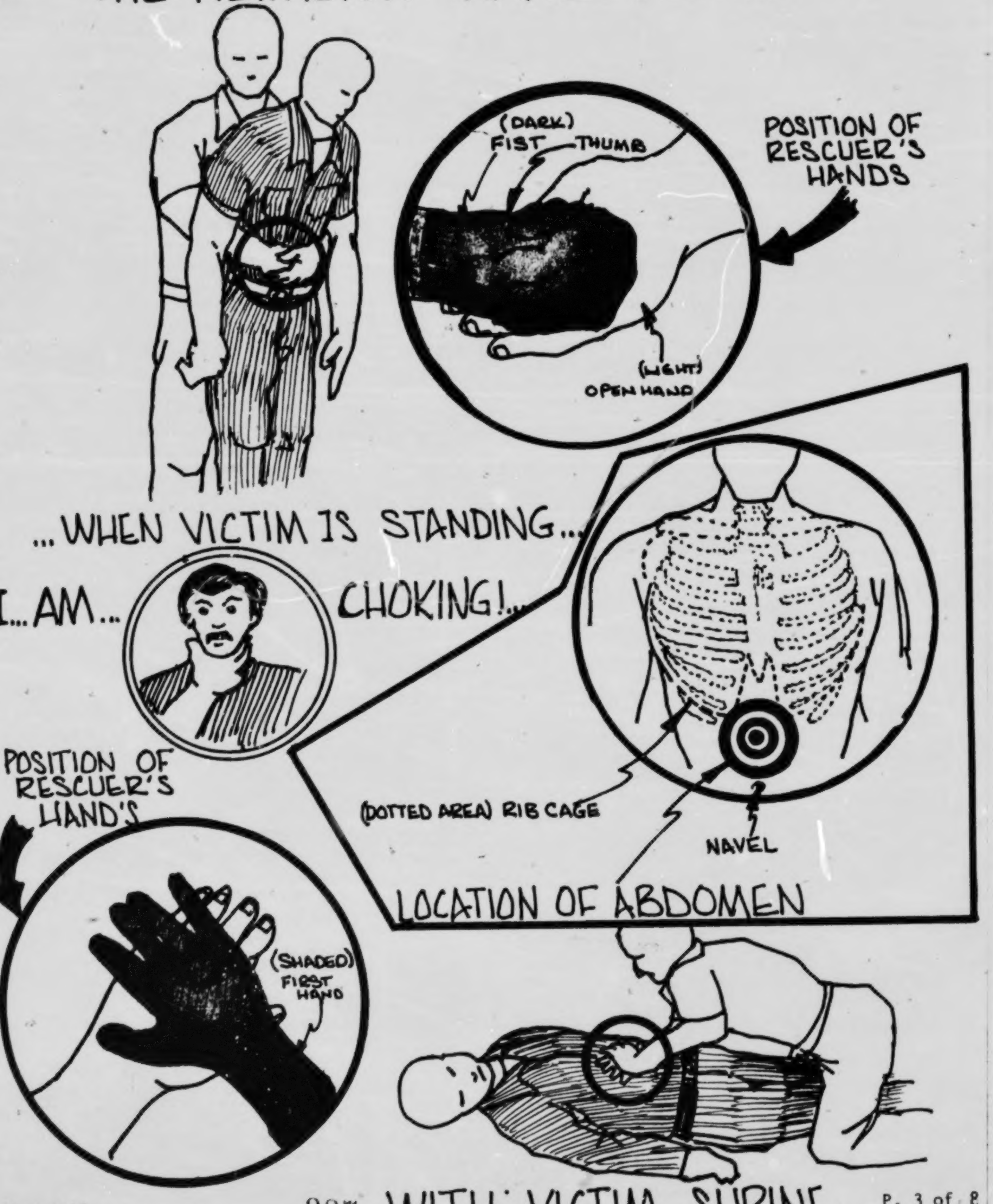
To perform this skill, the rescuer should step behind the victim, reach around the victim and place the thumb of one hand against the stomach just below the ribs. Tuck this thumb into the hand and make a fist. Place the free hand on the fist and quickly pull the victim against yourself. This action will force air from the lungs which, in turn, will push the object out of the throat.

Since the victims first reaction after the tug will be to breath in, it would be best to lean the victim over slightly before making the tug. This will cause the object to fall free of the victim's mouth and not be inhaled again.

As shown in the illustration, the maneuver can be done when the victim is supine, simply by straddling the victim and quickly pushing upward toward the victim's head. (The Heimlich maneuver can also be performed on a seated victim simply by pulling the victim against the back of the chair.)

However, if the victim is a pregnant female or any victim with a stomach injury, a substitute for the maneuver must be used. This substitute is called a "chest thrust". This thrust is performed by laying the victim face-up, straddle the victim, place the hands on the mid-sternum (center of the chest) and quickly push on the chest in the same manner as the maneuver performed on a supine victim. (Whenever the victim is supine, it is best, to turn the victim's head to the side, to permit the object to fall free of the mouth.)

THE HEIMLICH MANEUVER...


(DARK) FIST
THUMB
POSITION OF RESCUER'S HANDS
(LIGHT) OPEN HAND
...WHEN VICTIM IS STANDING...
"I...AM... CHOKING!...
(DOTTED AREA) RIB CAGE
NAVEL
LOCATION OF ABDOMEN
POSITION OF RESCUER'S HAND'S
(SHADED) FIRST HAND

...WITH VICTIM SUPINE...

Artificial Respiration:
If a victim is found unconcious, the rescuer should attempt to revive him by calling his name and shaking him gently. If the victim does not respond, the rescuer should check for breathing by; looking for the rising and falling of the chest, listening for breathing and feeling the breath of the victim. As illustrated, the rescuer may check all three signs of breathing at the same time by placing his head above the mouth of the victim and facing the chest. See figure 1.

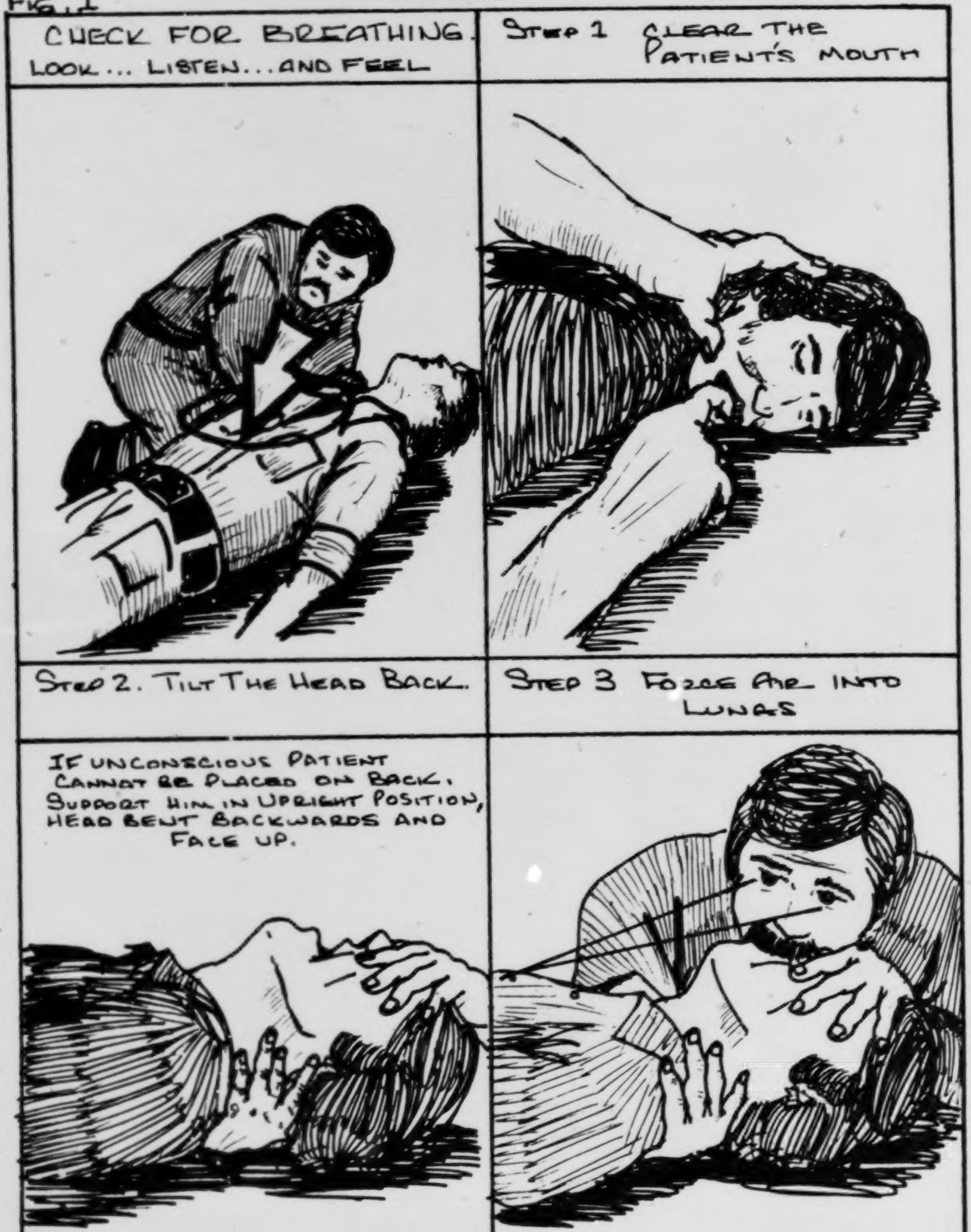
If there is no sign of breathing, the rescuer should begin the following steps immediately. Any of the following may revive the victim if performed correctly and quickly.

1. Turn the victim's head to the side and sweep through his mouth with your fingers. Remove anything that will come free (dentures, gum, food, dirt, blood, vomit, etc.)
2. Lay the victim on his back with his face up. The rescuer should place one hand on the victim's forehead and the other under the victim's neck. Tilt the victim's head back and slightly raise his neck. This step should make a clear airway from the victim's mouth to his lungs.
3. If the victim does not begin breathing on his own, the rescuer should try to force air into his lungs. Keeping both hands in the same position as in Step #2, pinch the victim's nostrils shut and force two or three deep breaths into the victims lungs. (Make sure that the rescuer's mouth seals tightly over the victim's mouth to be sure that the air is not escaping.)

   Release the seal to permit the victim to exhale. The rescuer should watch the victim's chest carefully to see it it rises with each of his breaths. (If the chest does rise and fall with each breath, go on to step #6.)
4. If the victims chest does not rise and fall with each breath, then the airway must still be blocked and another method of opening the airway must be found. In an unconcious condition, the victim's muscles will be totally relaxed and the tongue may have fallen back and is blocking the airway. To move the tongue, the rescuer should stick his thumb into the victims mouth, grab the chin with the remaining fingers and lift the entire jaw bone. Since the tongue is a muscle attached to the jaw bone, this motion will lift the tongue away from the airway. Holding the jaw in this position, the rescuer should try to blow a few breaths into the victim. (Getting a good seal from mouth to mouth will be more difficult since the rescuers thumb will still be in the victims mouth.)

   If it is not possible to open the victims mouth because of clenched teeth, the jaw thrust method should be used. To use this method, locate the section of jawbone directly under the victims earlobe. Place the first two fingers of each hand behind the bone on either side of the victim's head. Place the thumbs on the upper lip for support and lift the entire jaw bone enough to open a complete airway. Try to force a few more breaths into the victim. If the airway is open, move on to Step #6 while maintaining the jaw thrust.

Fig. 1



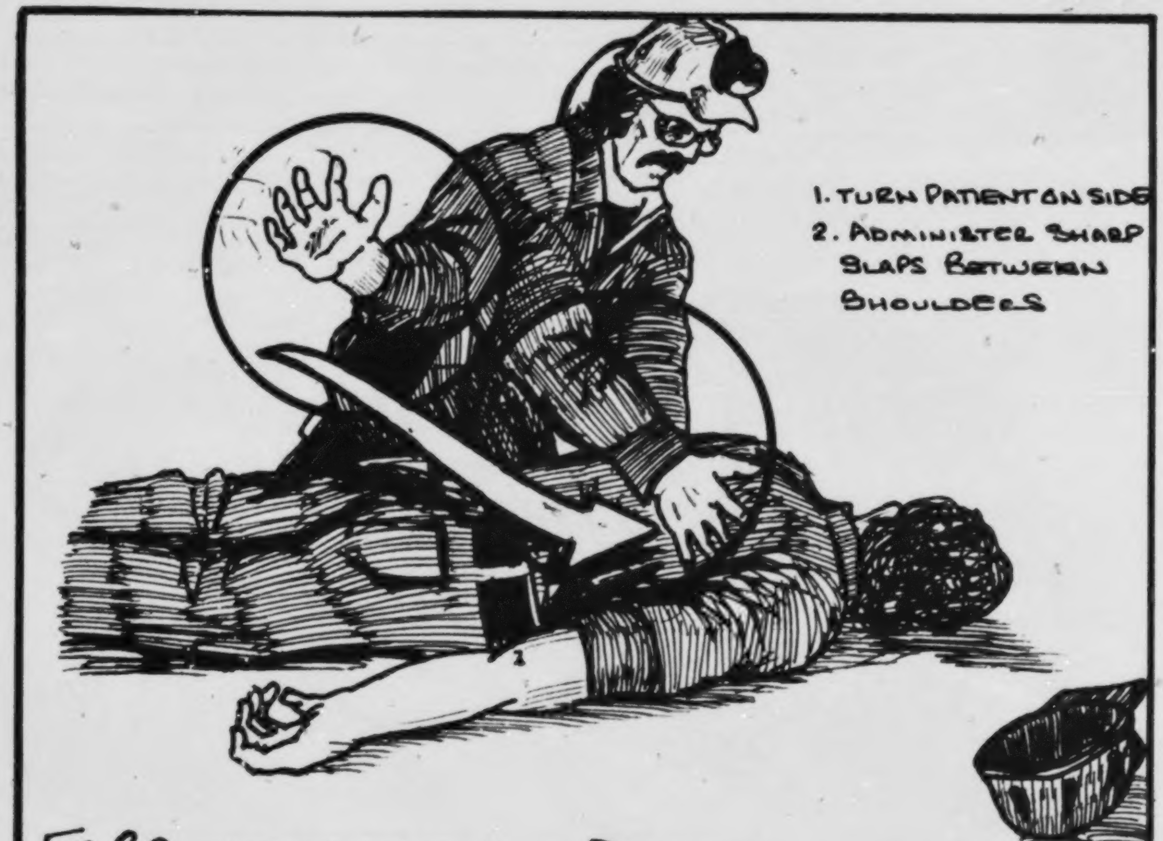
CHECK FOR BREATHING.
LOOK ... LISTEN ... AND FEEL

STEP 1 CLEAR THE PATIENT'S MOUTH

STEP 2. TILT THE HEAD BACK.

IF UNCONSCIOUS PATIENT
CANNOT BE PLACED ON BACK,
SUPPORT HIM IN UPRIGHT POSITION,
HEAD BENT BACKWARDS AND
FACE UP.

STEP 3 FORCE AIR INTO LUNGS



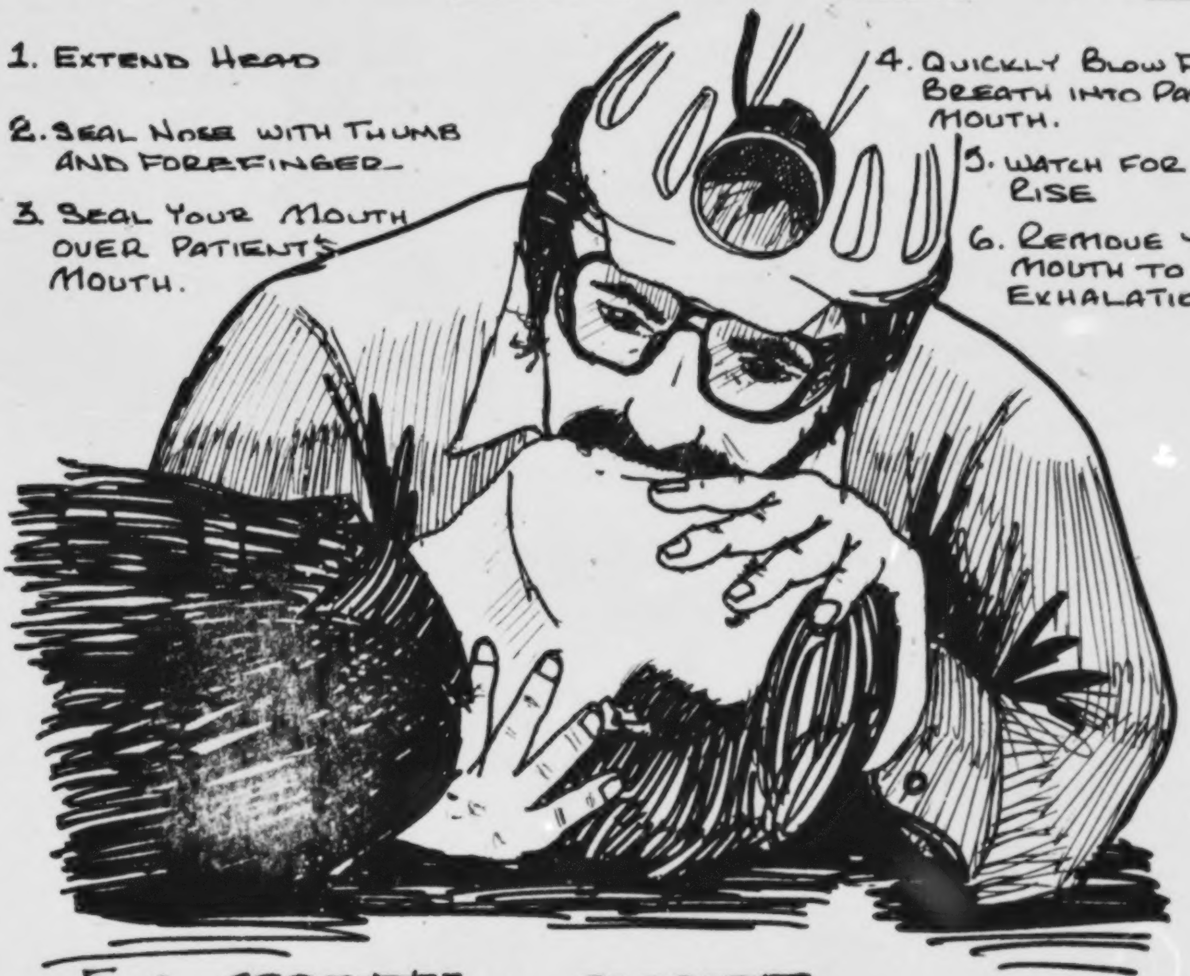
1. TURN PATIENT ON SIDE
2. ADMINISTER SHARP SLAPS BETWEEN SHOULDERS

FIG. 2 CLEARING THE AIR PASSAGE

5. If the previous methods fail to open an airway, roll the victim on his side and slap the center of the back (between the shoulder blades) three times with the heel of the hand. This method will loosen any object stuck in the throat. With the victim still on his side, sweep the mouth clean with the fingers. Roll the victim on his back, reposition his head as in step #2, and attempt to check the airway by forcing three breaths into the victims lungs. If none of these methods open the airway (rising and falling chest), try each method again in any order.
6. Once the airway is open, the victim may revive. If the victim does not begin breathing naturally, artificial resuscitation must begin. Many methods of resuscitation may be used. However, in an emergency situation, the mouth-to-mouth method is the most effective.

Mouth-To Mouth Resuscitation:

If the previous steps are performed properly, the victim will already be positioned for mouth-to-mouth resuscitation. A fully-grown adult breathes about twelve times per minute and more oxygen is inhaled than needed to supply one person. Therefore, enough oxygen is taken into the rescuer's lungs to supply him and the victim. This is the basic principle of mouth-to-mouth resuscitation, since the rescuer exhales enough oxygen to support the victim's life. (See figure #3)



1. EXTEND HEAD

2. SEAL NOSE WITH THUMB AND FOREFINGER

3. SEAL YOUR MOUTH OVER PATIENT'S MOUTH.

4. QUICKLY BLOW FULL BREATH INTO PATIENT'S MOUTH.

5. WATCH FOR CHEST TO RISE

6. REMOVE YOUR MOUTH TO ALLOW EXHALATION.

FIG.2 MOUTH-TO-MOUTH RESUSCITATION

To perform mouth to mouth resuscitation, the rescuer should take a deep breath and blow the air quickly and evenly into the victims lungs at the rate of about twelve times a minute. The rescuer should watch for the chest to rise. If the chest does not fall naturally after the rescuer removes his mouth, he should press gently on the victims chest. This procedure should force the air out of the victims lungs. If the stomach begins to rise, the rescuer should turn the victims head to the side and press gently on the stomach, since this indicates that air is slipping by the "windpipe", into the stomach. Pressing the stomach may cause some fluid to be pushed out, so the rescuer should sweep the mouth clean again.

If the victim has a jaw or mouth injury, the rescuer may close the mouth and blow into the victim's nose. The rescuer should permit the victim to exhale through the mouth.

The rescuer must continue mouth-to-mouth resuscitation until the victim recovers or the rescuer is replaced by someone better qualified. The process of mouth-to-mouth resuscitation may continue when transporting the victim. (Do not interrupt the process unless necessary and only interrupt it for a few seconds if necessary.) If the rescuer is alone with the victim and no help is available, the rescuer should continue giving mouth-to-mouth resuscitation until he cannot continue, because of exhaustion.

Some of the most common mistakes made when performing mouth-to-mouth resuscitation are:

1. The rescuer does not position the head correctly and the airway is not open.
2. The rescuer does not seal the victim's mouth and nose.
3. The rescuer does not open the victim's mouth wide enough or does not get a good seal when blowing the air into the victim's lungs.

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
STUDENT NAME
UNIT 03 MODULE 04 TASK 020
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *First Aid treatment for Circulatory Failure.*

Objective:
After studying the material, the student will demonstrate and explain the first aid treatment for circulatory failure. The student will also answer the review questions to 80% accuracy.

Introduction:
Cardio pulmonary resuscitation (CPR) is the only acceptable treatment for circulatory failure. Because of the complicated nature of this technique, it has (in the past) been reserved for use by specially trained medical people. With the increase in heart attacks, the procedure is now being taught to all first aid and safety concious citizens. However, the technique is still very difficult and precise. The American Red Cross and American Heart Association offer much training in this field. To become qualified in the use of CPR, a worker must take an approved course offered by these organizations. This task sheet will only mention the basic steps involved in CPR, in the hopes that even this basic knowledge may help save a life.

Procedure:
1. Read the introduction twice.
2. Study the information sheet and illustrations.
3. Practice the procedure on a dummy. (Performing CPR on a partner may seriously injure him.)
4. Answer the review questions.

Review Questions:
1. Briefly explain the purpose of performing CPR.

2. How does the rescuer know, if the victim's circulation has stopped?

3. If the victim's cardiac arrest has been witnessed by the rescuer, what technique can be used by the rescuer to restart the heart?

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PREPARED BY: Mr. James DeHaven

4. If the cardiac arrest was witnessed by someone other than the rescuer, may the rescuer use this technique?

5. Briefly explain how to locate the xiphoid process.

6. When performing CPR, why should the rescuer keep the remainder of the hand (other than the heel of the hand) off the victim's chest?

7. When may the rescuer stop performing CPR on a victim?

INFORMATION SHEET

To better understand the principles of CPR, the rescuer should have a basic understanding of the circulatory system. The circulatory system involves the entire network of veins and arteries, the blood, heart and lungs. Each of these organs and substances has a particular "job" within the body - and each "job" is performed in a specific order.

The heart is a pump which pushes blood throughout the entire body. As the blood passes the lungs, it collects oxygen and distributes this oxygen to all muscles (especially the brain), before the blood returns to the heart and begins the cycle again.

As you can see, each of the "vital" organs is necessary to maintain life. Any interruption in the breathing and circulation may result in death. For example, when breathing and circulation stop, the victim is pronounced "clinically dead". If the process of breathing and circulation is not started again within minutes, it will be impossible to save the victim's life. (After a few minutes without oxygen, brain damage will begin and continue to worsen until the victim cannot possibly survive.) Fig. #1.

As shown in First Aid Treatment for impaired breathing, the rescuer can keep oxygen in the blood by artificial respiration. But if the heart does not begin pumping the blood to the brain and muscles, the victim will die.

When breathing stops (respiratory arrest), the heart may continue pumping blood for some time. Artificial Respiration (if properly applied) can revive the victim. When the heart stops (cardiac arrest) breathing will also stop. To revive the victim artificial respiration and artificial circulation must be applied. This is cardiopulmonary resuscitation (CPR).

To determine if a cardiac arrest has occurred, the rescuer must locate the carotid pulse. To locate this pulse, the rescuer should place the first two fingers of either hand on the victim's larynx

0 MINUTES	4 MINUTES	6 MINUTES	10 MINUTES
CLINICAL DEATH		BIOLOGICAL DEATH	
(0-4 MIN.) BRAIN DAMAGE NOT LIKELY	(4-6 MIN.) BRAIN DAMAGE PROBABLE	(6-10 MIN.) BRAIN DAMAGE PROBABLE	(OVER 10 MIN.) BRAIN DAMAGE ALMOST CERTAIN

FIG.1 CHART SHOWING BIOLOGICAL & CLINICAL DEATH

("Adam's Apple"). As shown in Fig. #2, slide the fingers into the small groove about 1 1/2" to 2" on either side of the larynx. A small, "thumping" should be felt if the heart is pumping blood to the brain. If no pulse is felt, the heart has stopped working. (Leave your fingers in this position for a few seconds, to be positive no pulse is felt.)

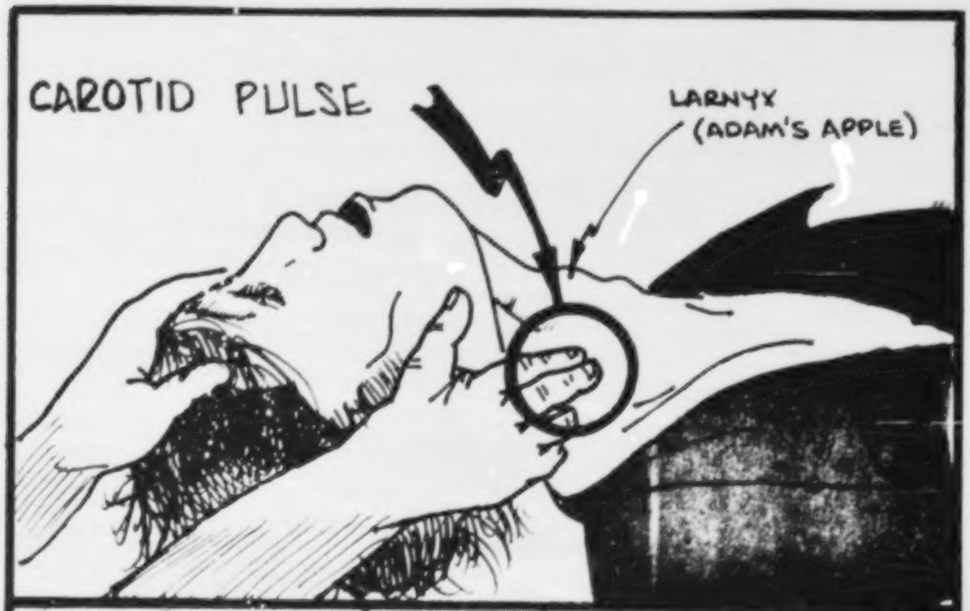


FIG.2 PALPATION OF THE CAROTID PULSE

The instructions for performing CPR is different, if the rescuer actually sees the victim collapse. (This is called a witnessed arrest.) If the rescuer does not actually see the victim collapse, it is called an unwitnessed arrest.

Unwitnessed Cardiac Arrest:

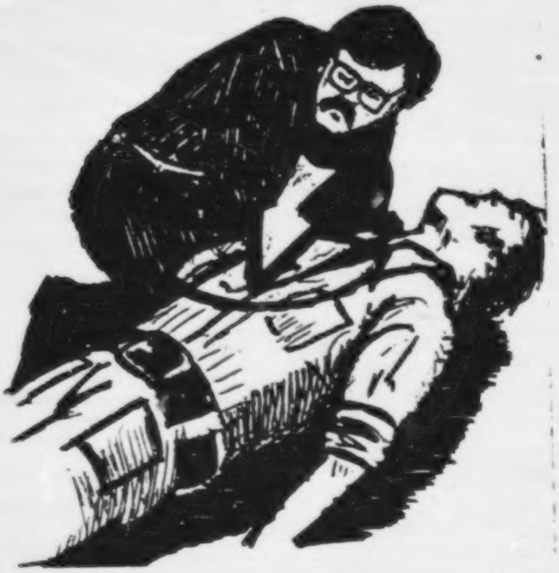
If a rescuer does not witness the collapse of a victim, but suspects that a cardiac arrest has taken place, that rescuer should:

1. Lay the victim on his back.
2. Tilt the victim's head and open the airway.
3. Check for any sign of breathing. (The rescuer may hear or feel the victims breath or see the lungs expanding.) (See Fig. #3.)

FIG. 3

LOOK FOR CHEST MOVEMENT

LISTEN & FEEL FOR AIR EXCHANGE



4. If there is no sign of breathing, the rescuer should blow four quick, deep breaths (mouth-to-mouth) into the victim's lungs, without waiting for the lungs to completely collapse, after each breath.
5. Check the carotid pulse for signs of heart failure.
6. If no pulse is present within a few seconds and breathing has not resumed naturally begin CPR, (following the instructions given later).

Witnessed Cardiac Arrest

Often, the victim will show signs of heart trouble previous to cardiac arrest. Many times the rescuer may actually witness the victim collapsing from heart failure. If the rescuer is near enough to the victim, to reach him within the first minute following the heart failure, that rescuer should:

1. Lay the victim on his back.
2. Tilt the victim's head to open the airway and check the carotid artery for a pulse.
3. If no pulse is present, the rescuer may use a technique called a precordial thump. (This method can only be used within the first

minute, following the cardiac arrest.) This "thump" is performed by raising a clenched fist 8 to 12 inches above the chest and giving the victim a single blow over the middle of the sternum (See Fig. #4). This blow may restart the pumping action of the heart and be enough first aid treatment to revive the victim. (If the cardiac arrest was caused by electrical shock, the rescuer may administer a precordial thump within the first ten minutes following the cardiac arrest.)

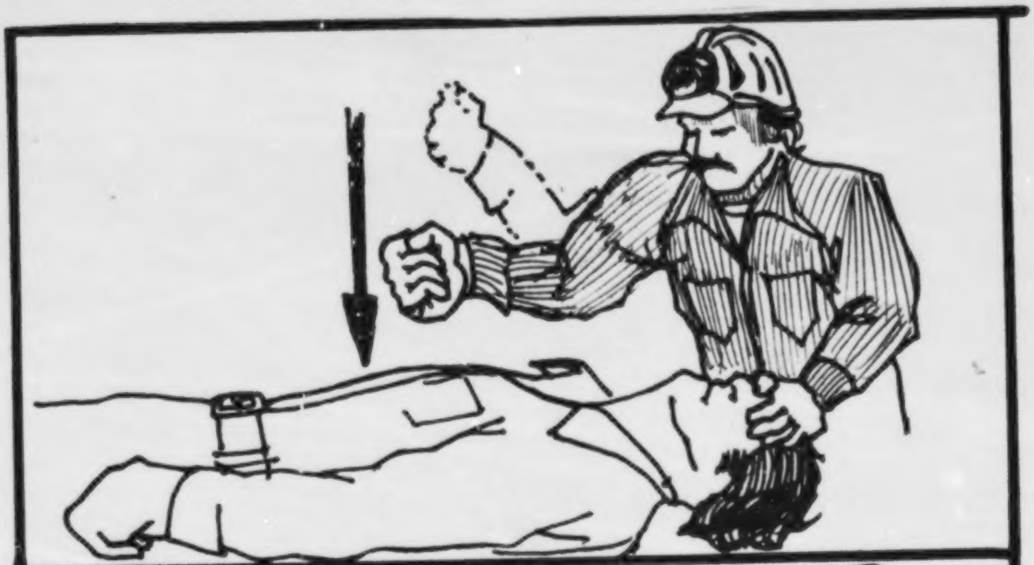


FIG.4 PRECORDIAL (CHEST) THUMP

4. If the victim has not been breathing, give four quick breaths. (Mouth to mouth)
5. If normal breathing and circulation are still not working, begin CPR.

Cardiopulmonary Resuscitation (CPR):
CPR is a process by which the rescuer actually forces blood from the victim's heart, releases the pressure, and permits the heart to refill with blood. This process is done by squeezing the heart between the sternum and backbone. (See Fig. #5) By using this method in addition to artificial respiration, the rescuer is helping the circulatory system restart it's action. To perform the actual CPR, the rescuer should:

1. Locate the xiphoid process and hand position as shown in fig. #6. The xiphoid process is a soft, bone-like material at the base of the sternum. If the rescuer should press directly on the xiphoid, this pressure may push the point of the xiphoid into some lower organs and cause severe damage.

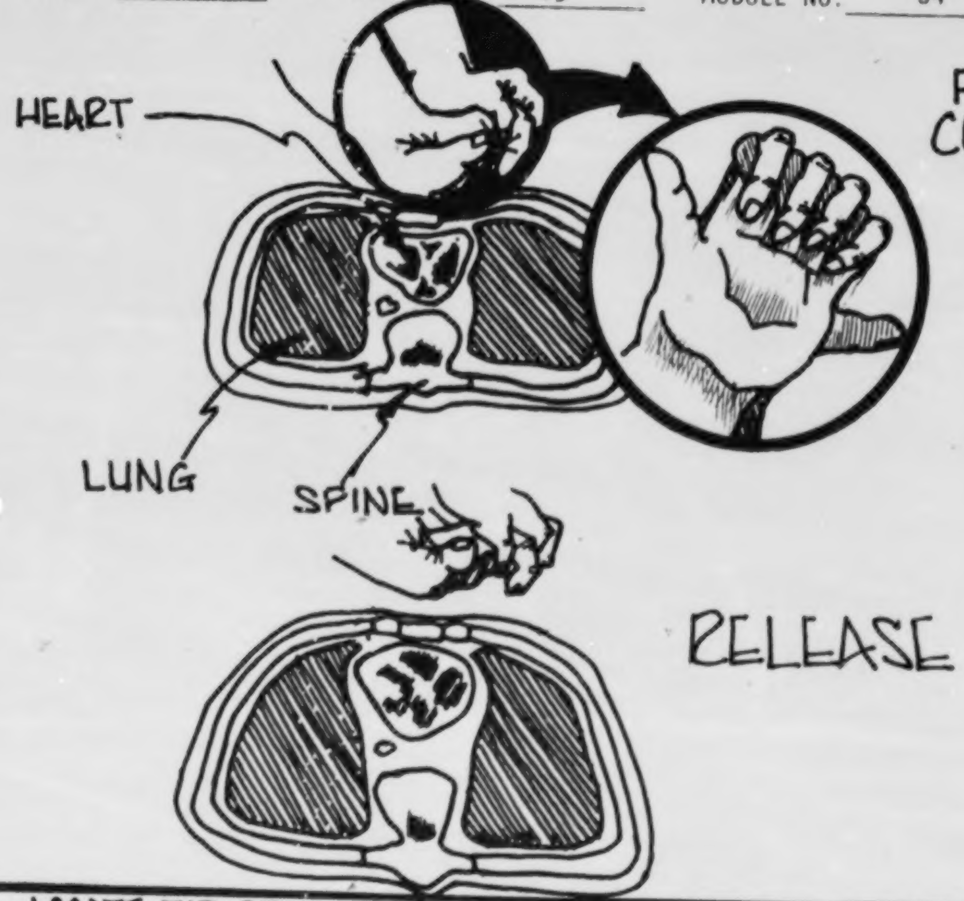

HEART
LUNG
SPINE
RELEASE

FIG. 5
COMPRESSION

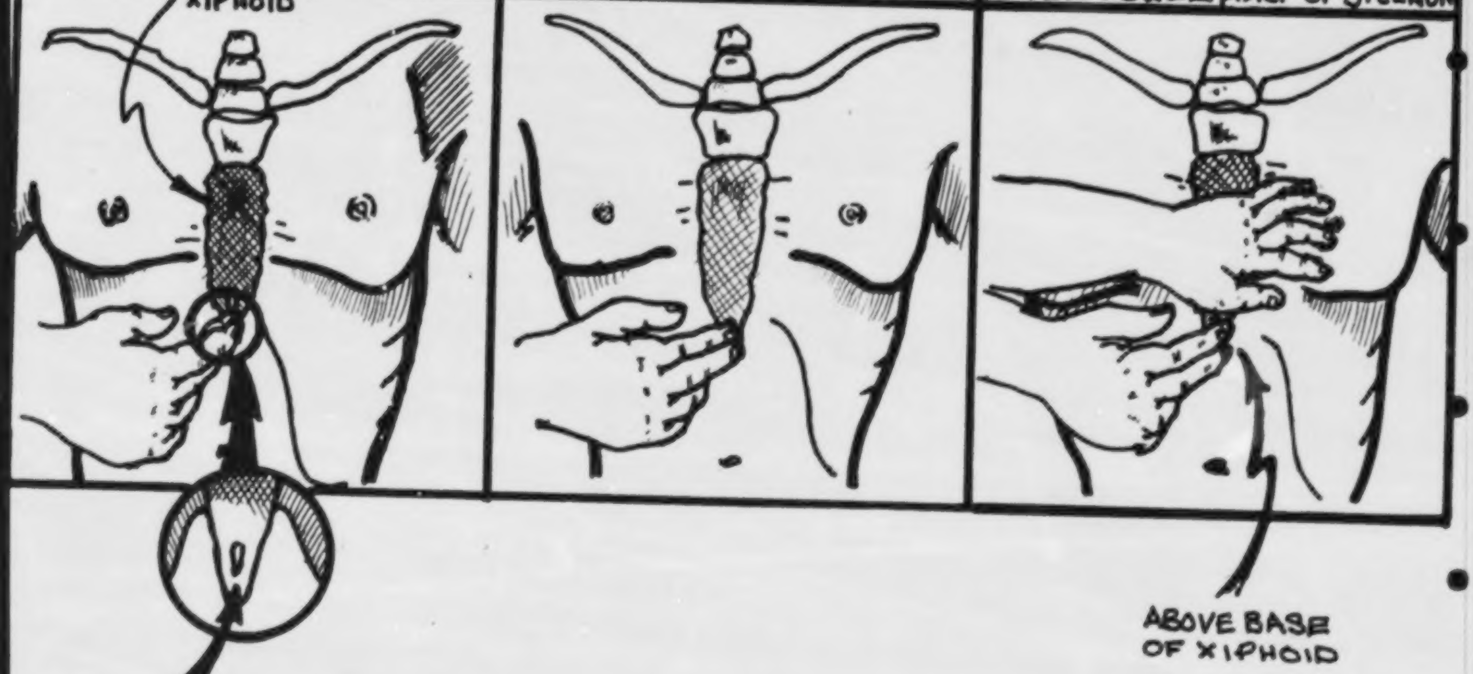

XIPHOID
ABOVE BASE OF XIPHOID
MIDDLE FINGER HERE (ON TIP)

FIG.6 LOCATE TIP OF XIPHOID

MEASURE UP TWO FINGER WIDTHS FROM TIP OF XIPHOID

PLACE HEEL OF OTHER HAND OVER LOWER HALF OF STERNUM

2. The rescuer should couple his hands as shown in figure #7. (Do not lift the hands from the victim's chest to couple them, since you will have relocate the xiphoid to replace the hand.) Keep the hands on the sternum, and do not permit any part of the hand (besides the heel of that hand) to touch the victim.

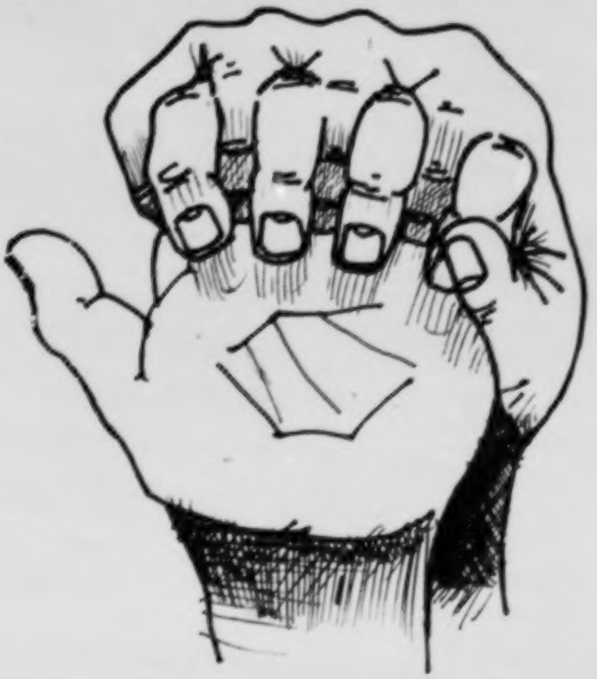


FIG. 7 POSITION OF HANDS

3. The rescuer should position himself at the side of the victim as shown in Fig. #8.
4. Keep the elbows "locked" in place and the arms straight, press straight down on the victim's chest, apply pressure for one second and then release the pressure without removing the hands from the position on the sternum. (This is the compression step and is designed to push the blood from the victim's heart.)
5. Each compression of one second (approximately) should be followed by a release of pressure, lasting about a full second. At the end of each 15 compressions, 2 quick breaths should inflate the victim's lungs.
6. Repeat the cycle of compressions and breaths until: the victim revives, the rescuer cannot continue, or the rescuer is replaced by medical professionals. (Fig. #9).
7. If two rescuers are available, one rescuer should make the compressions and the other should perform the mouth-to-mouth resuscitation. However, the second rescuer will blow one quick breath into the victim' lungs following the release of every fifth compression.

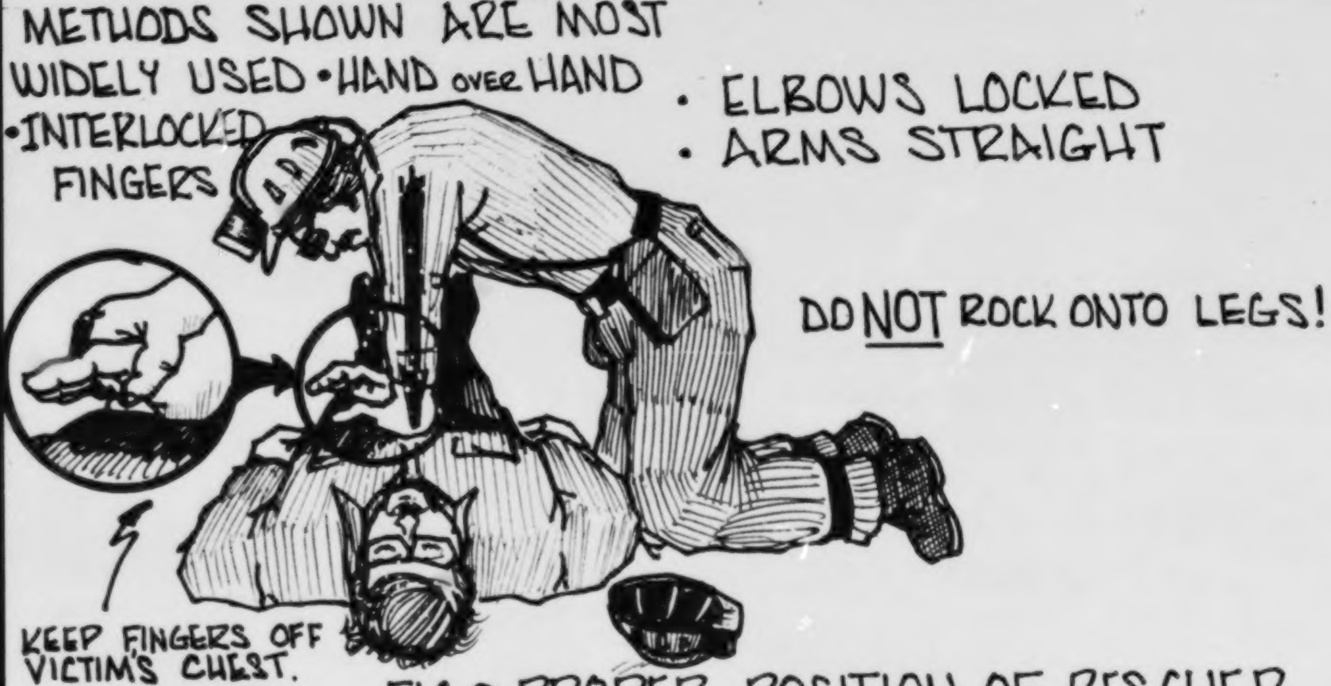

METHODS SHOWN ARE MOST WIDELY USED
• HAND over HAND
• INTERLOCKED FINGERS
• ELBOWS LOCKED
• ARMS STRAIGHT
DO NOT ROCK ONTO LEGS!
KEEP FINGERS OFF VICTIM'S CHEST.

FIG.8 PROPER POSITION OF RESCUER

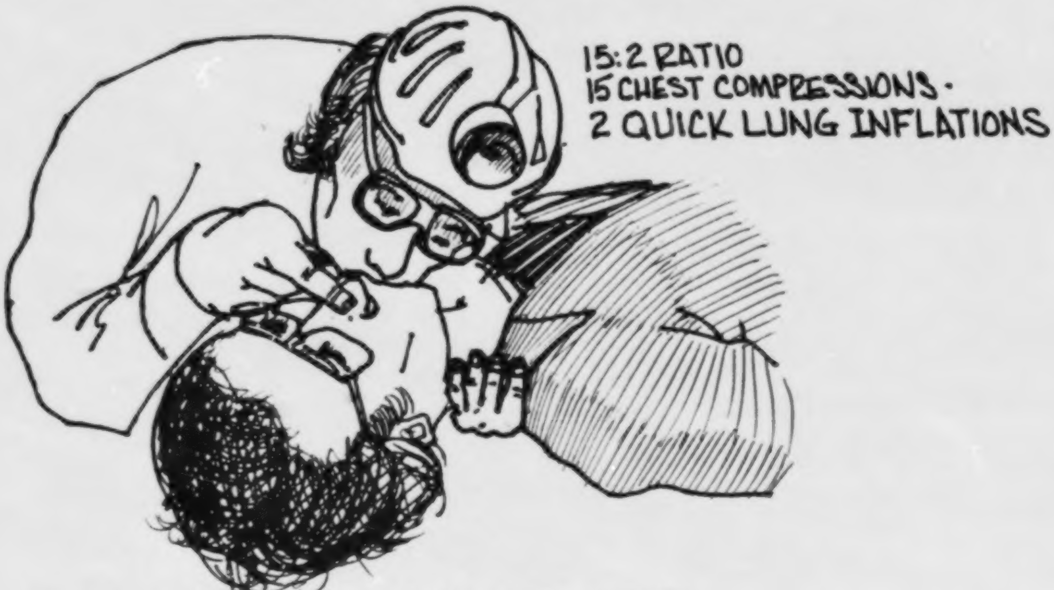

15:2 RATIO
15 CHEST COMPRESSIONS •
2 QUICK LUNG INFLATIONS

FIG.9 ONE RESCUER CPR

There are certain basic points to remember when performing Cardiopulmonary resuscitation.

- CPR may continue while transporting the victim to a medical center. However, in order to perform CPR effectively, it is important to have the victim laying on a solid surface. (Spinal board, plank, etc.)
- When making the compressions, the rescuer should press straight down on victim's chest and not "rock" on his legs.

-When making ventilations (mouth-to-mouth) be sure the airway is open by keeping the head tilted and observe the movement of the victims chest.
-Relocate the xiphoid and position the hand following each ventilation.
-Do not interrupt CPR for more than a few seconds, once it has begun.

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
STUDENT NAME
UNIT 03 MODULE 04 TASK 030
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *First Aid treatment for severe bleeding.*

Objective:

After studying the material, the student will demonstrate and explain the methods of controlling external bleeding to the satisfaction of the instructor. The student will also answer all review questions to 80% accuracy.

Introduction:

For some individuals, the sight of blood and an open wound is a sickening experience. The most difficult skill to develop, when treating severe bleeding is, the ability to remain calm. This skill will be helpful to the worker and the victim.

Materials:

A complete mine first aid kit.

Procedure:

1. Reread the objective.
2. Study the information sheet.
3. Demonstrate and explain the first aid treatment for bleeding.
4. Answer the review questions.

Review Questions:

1. What method should be used first, to control severe bleeding?
2. When should the rescuer not elevate a wound?
3. What is a pressure point?
4. What is an artery?
5. Where is the carotid pressure point?

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PREPARED BY: Mr. Alton Hewitt & Mr. James DeHaven

6. When should the rescuer remove a tourniquet?

7. How should an object in the wound be removed?

8. When should a rescuer treat minor cuts and scrapes?

9. When should a tourniquet be used?

10. What is the most difficult skill to develop when treating severe bleeding?

INFORMATION SHEET

Severe bleeding may cause death in a few minutes. For this reason, a rescuer must react quickly to control bleeding wounds.

The easiest method for controlling bleeding is called direct pressure. After locating the wound, the rescuer should simply press on that wound with his bare hand. If compresses (or clean handkerchiefs) are available, the rescuer should place the compress on the wound and press with the hand. If the compress becomes blood-soaked, simply add another compress on top of the first. (Do not remove the soaked compress since this may cause additional bleeding or infection. Continue adding more compresses if necessary.) Wrap the compresses to the arm with a snug bandage before transporting the victim. (See fig. #1.)

When continuing direct pressure, the rescuer may raise the injured area (arm, leg or head) to a level higher than the heart. This procedure will limit the amount of blood being pumped to the wound. (Only use elevation if the procedure will not cause any more damage to the victim's condition.)

If the wound continues bleeding as seriously as before the direct pressure was applied, the rescuer may stick his fingers into the wound and try to pinch the vein or artery shut.

If both these methods fail to control the bleeding, apply direct pressure on a pressure point. A pressure point is a position where a main artery is close to the skin and directly over a bone. Pressure on this point will stop the flow of blood to a particular section of the body. There are twenty-two pressure points (eleven on the right side of the body and eleven on the left), but only three are generally used to control bleeding, since they are the most effective.

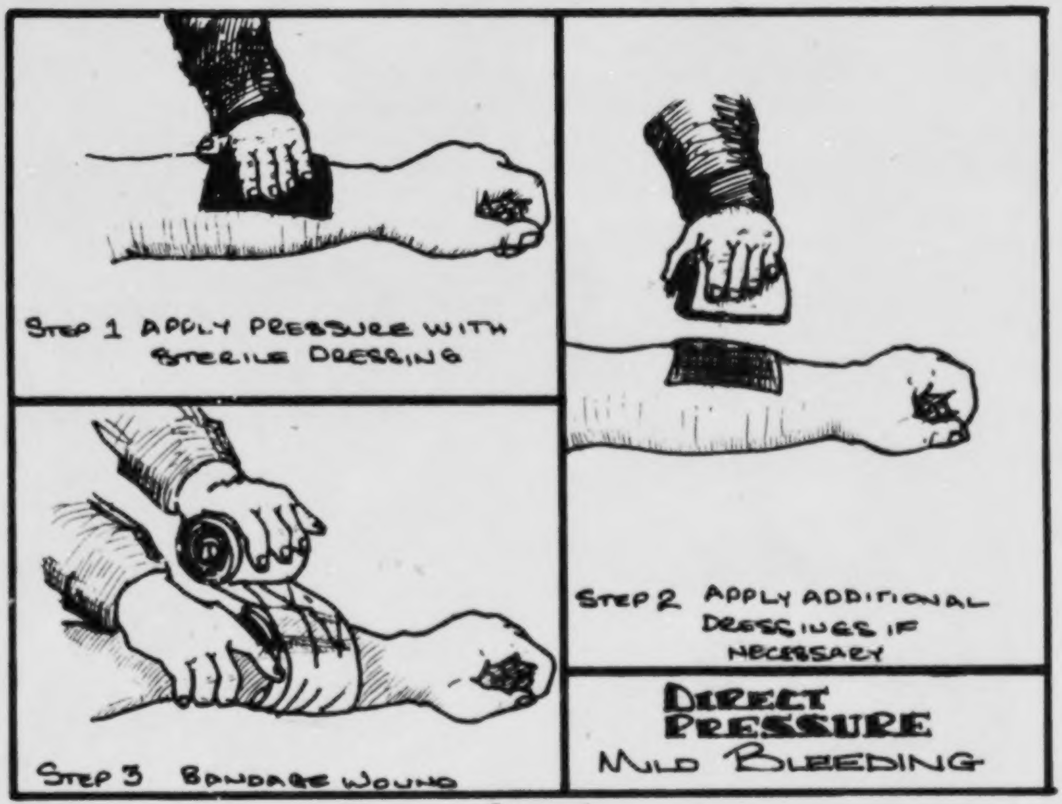

STEP 1 APPLY PRESSURE WITH STERILE DRESSING
STEP 2 APPLY ADDITIONAL DRESSINGS IF NECESSARY
STEP 3 BANDAGE WOUND
DIRECT PRESSURE
MILD BLEEDING

fig. 1

For bleeding of the lower arm, the brachial artery must be pressed. To locate this pressure point, straighten the arm and raise it level with the shoulder and place the palm up. The rescuer should place the four fingers of either hand half-way between the elbow and the armpit on the inside of the arm. Locate the groove formed between the muscles and the bone. Press on this area with the fingers. The bleeding should stop in a few seconds. (See fig. 2.)

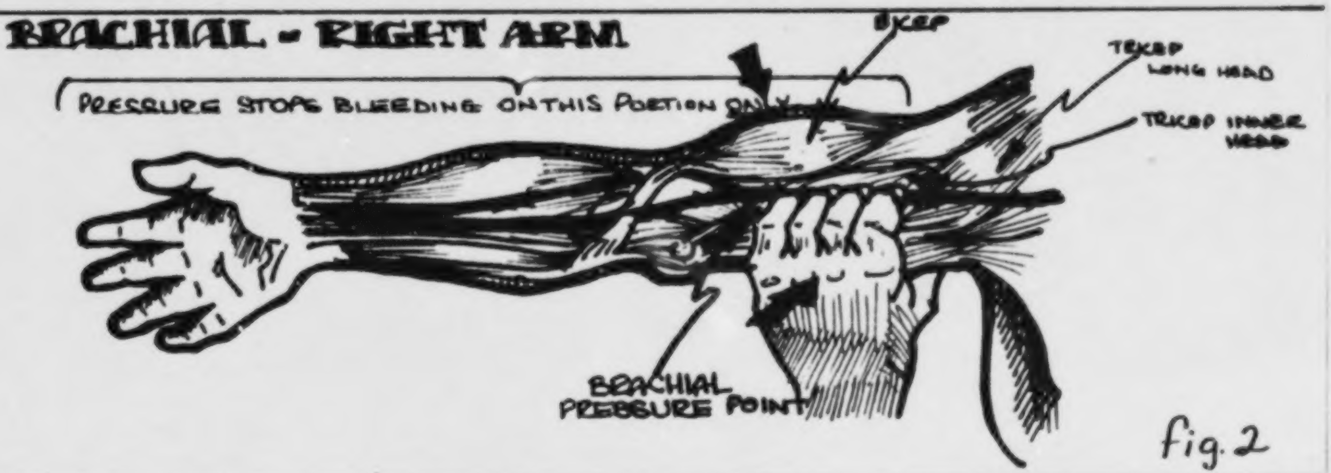

BRACHIAL - RIGHT ARM
BICEP
TRICEP LONG HEAD
TRICEP INNER HEAD
PRESSURE STOPS BLEEDING ON THIS PORTION ONLY
BRACHIAL PRESSURE POINT

fig. 2

PROGRAM D-2 UNIT NO. 03 MODULE NO. 04 TASK NO. 030

If the victim's leg is bleeding, the femoral artery must be located and pressed with the palm of the rescuer's hand. To find this pressure point simply move your hand to the inside of groin, where the leg joins the rest of the body. As soon as you've found a pulse, press with the heel of the hand, on the pulse. (You must press fairly hard to stop the bleeding in the leg.) The femoral pressure point can be found at the top of each leg. So, if the left leg is bleeding, use the left pressure point. (See fig. #3.)

PRESSURE POINTS

FEMORAL - RIGHT LEG

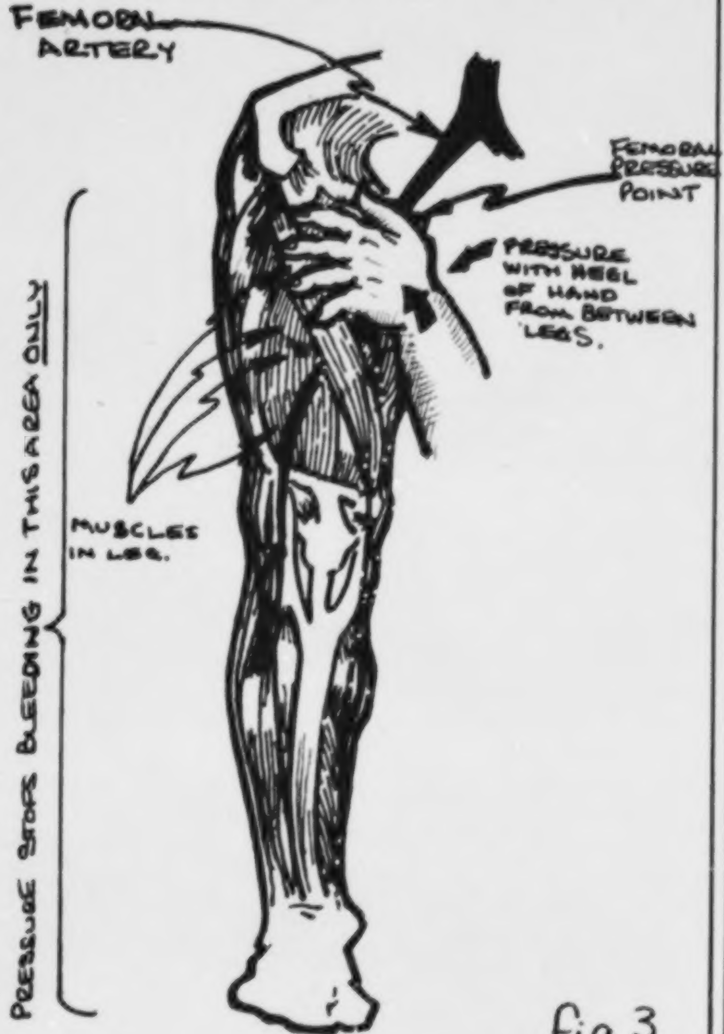

FEMORAL ARTERY
FEMORAL PRESSURE POINT
PRESSURE WITH HEEL OF HAND FROM BETWEEN LEGS.
MUSCLES IN LEG.
PRESSURE STOPS BLEEDING IN THIS AREA ONLY

fig. 3

CAROTID - NECK

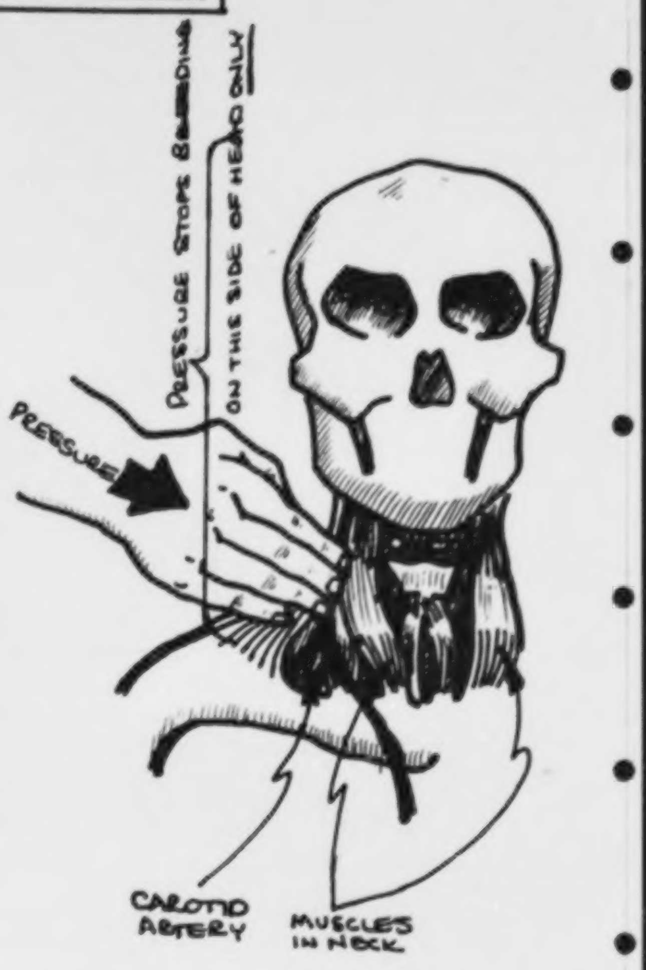

PRESSURE STOPS BLEEDING ON THIS SIDE OF HEAD ONLY
PRESSURE
CAROTID ARTERY
MUSCLES IN NECK

fig. 4

For severe bleeding of the head or neck, the carotid artery must be located and pressed. To locate this pressure point, place the first two fingers (middle and index fingers) on the larynx ("Adam's Apple"). Slide your fingers to the small groove an inch or two on the side of the larynx. If you feel a pulse you have located the pressure point and direct pressure should stop the bleeding. (See fig. 4) (There are carotid pressure points on both sides of the larynx. Only use the pressure point that is closest to the wound. Never use both pressure points at the same time since this would stop the flow of blood to the brain.)

For the best results, apply direct pressure to the wound and the pressure point at the same time. Remember, a pressure point must be located between the heart and the injury or pressure will not stop the bleeding.

As a last possible resort, a tourniquet may be applied. However, since the use of a tourniquet may result in the loss of an arm or leg, it must be used only if the other methods fail to stop the bleeding.

To apply a tourniquet is a simple procedure. Locate a pressure point between the heart and the injury, as close to the wound as possible, but not on the wound's edge. (It's not necessary to use a pressure point, since the tourniquet will stop the bleeding if applied near the wound.)

Federal Law 75.1713-7 requires that tourniquets will be kept in the first aid box in each section. Directions for use and the materials needed for a good tourniquet are included. However, the rescuer must know how to apply a makeshift tourniquet, since the control of bleeding cannot be delayed.

To apply a tourniquet, place a pad or small object on the artery. (The object will help the procedure but isn't necessary to the tourniquet.) Wrap a cloth or handkerchief around the limb and tie a loose knot. Insert a device (stick, rod, etc.) into the knot and pull the knot tightly. Twist the device to tighten the tourniquet until the bleeding has stopped. Mark the time the tourniquet was applied in plain view. (If necessary, the time may be marked on his forehead with the victim's own blood.) The rescuer should not remove or loosen the tourniquet. Only a doctor should release it. Remember that a tourniquet is a last resort and should be used only when no other method will stop the bleeding. (See fig. 5)

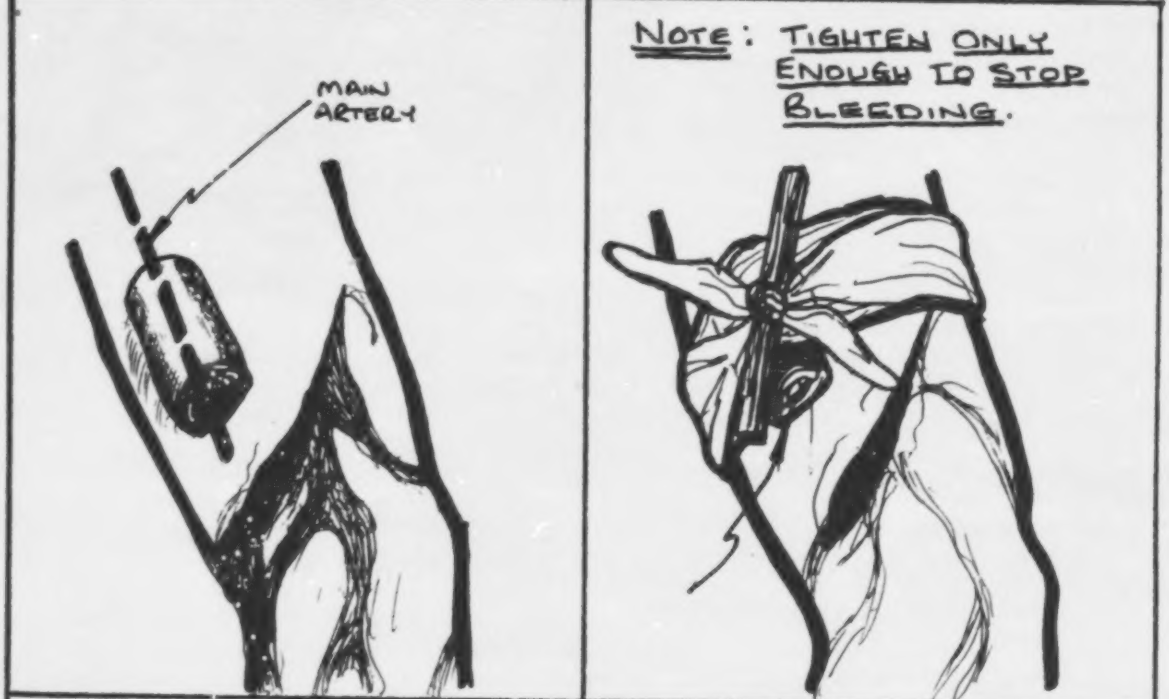
If an object is found in the wound, do not attempt to remove it. The object may be preventing any further bleeding by sealing the wound. Wrap the wound carefully to prevent the object from moving and do not attempt to move it while transporting the victim.

Severe bleeding of any parts of the body other than mentioned, should be controlled by direct pressure. Tourniquets and pressure points are too difficult to use in the areas of the chest, back and stomach.

Internal Bleeding

Some injuries may cause severe internal bleeding that is not apparent to the rescuer. Since internal bleeding cannot be seen, it is difficult to recognize and treat. Some of the symptoms that may be seen, when internal bleeding is present are: cold & pale skin, irregular breathing dizziness, thirst, weak and rapid pulse, blood may be flowing from the mouth, nose and ears, and later, the victim may become unconcious.

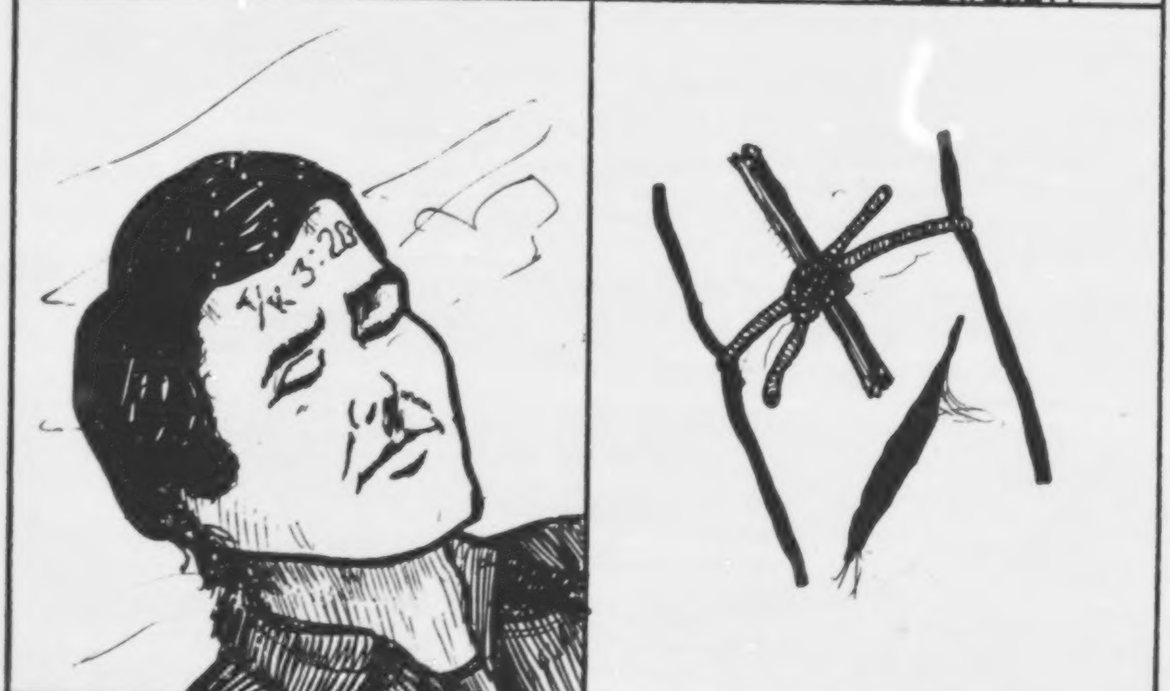
Since it is difficult for the rescuer to locate the source of the bleeding, the first aid treatment for internal bleeding is very general. 1) Lay the victim on his back with the head lower than the body (except for victims



NOTE: TIGHTEN ONLY ENOUGH TO STOP BLEEDING.

STEP 1 PLACE PAD OVER ARTERY

STEP 2. KNOT THE MATERIAL AND INSERT A DEVICE TO TIGHTEN TOURNIQUET.



STEP 3 MARK TIME TOURNIQUET WAS APPLIED

∴ USE OF MATERIAL THAT IS TOO THIN MAY INSURE BLOOD VESSELS AND UNDERLYING TISSUE.

fig. 5

of a skull fracture, or stroke). 2) Apply cold cloths to the place on the victim's body, from where the rescuer believes that bleeding to originate. 3) Never give water or any other liquids to a bleeding victim, since this may induce vomiting. (However, if the victim is extremely thirsty, the rescuer may let the victim suck on a wet rag, until the thirst is quenched.) 4) Since the victim has suffered a loss of oxygenated blood, the victim must receive oxygen. (However, only trained medical personnel may administer oxygen.) The first aid treatment for severe bleeding must include, keeping all unnecessary workers away from the victim, to provide that victim with adequate "breathing room". 5) Transport, the victim of any severe bleeding, as quickly as possible to the nearest medical facility.

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
STUDENT NAME
UNIT 03 MODULE 04 TASK 040
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *Bandaging and Dressing Wounds.*

Objective:

After studying the material, the student will explain the basic rules and principles of bandaging and dressing wounds to the satisfaction of the instructor by answering the review questions to 80% accuracy.

Introduction:

The terms dressing and bandage are sometimes confused. To better understand the uses of these terms, a brief definition is necessary.

Dressings are applied directly to the wound to control bleeding and prevent infection. All dressings should be sterile. (Gauze compresses are dressings.) Bandages are used to hold these dressings and don't need to be sterile. (Although, sterile bandages would be much better, when treating an open wound.)

Procedure:

1. Reread the introduction and objective.
2. Study the information sheet.
3. If required by the instructor, practice bandaging and dressing wounds on a partner.
4. Answer the Review Questions.

Review Questions:

1. Briefly explain the differences between dressings and bandages.

2. Name three reasons for applying dressings to open wounds.

3. What is a cravat?

4. When bandaging limbs, why should the fingers or toes be exposed?

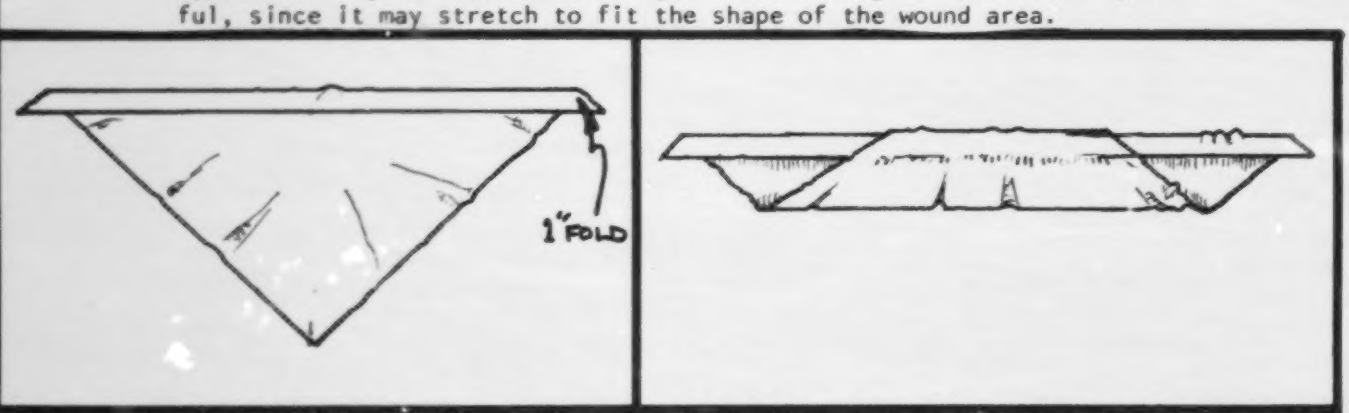
ISSUE 1
DATE 6/16/77
P 1 OF 2
REVIEWED & APPROVED
RESEARCH MSK
INSTRUCTOR
ADMINISTRATION
PREPARED BY: Mr. James DeHaven

PROGRAM D-2 UNIT NO. 03 MODULE NO. 04 TASK NO. 040

INFORMATION SHEET

When applying dressings to a wound, it is best, if the dressing is sterile (without germs). However, in most emergency situations, any clean material may be used as a dressing. The dressing should be placed, in a manner that covers the entire wound and will help control bleeding. All objects found in the wound, should be dressed in a manner that prevents that object from moving. Dressings should be applied to prevent further bleeding and any knots that may be tied in a dressing, should be tied over the bleeding wound, to place direct pressure on that wound.

Cover bandages are meant to hold the dressing in place and prevent any further damage, due to unnecessary movement. The most common type of bandage is a triangular bandage. (Fig. #1) When folded, the triangular bandage is called a cravat. (Also Fig. #1.) Another common type of bandage is the roll bandage. This bandage is particularly useful, since it may stretch to fit the shape of the wound area.



TRIANGULAR BANDAGE w/1" FOLD

MEDIUM CRAVAT BANDAGE

FIG.1 TRIANGULAR BANDAGE W/ CRAVAT

Most first aid textbooks, have many different methods of bandaging particular injuries listed, illustrated and explained. However, in a emergency situation, it will be unlikely that the rescuer will remember the specific textbook method of bandaging that particular injury. (Although, these methods are usually the best method possible.) It isn't necessary that emergency bandaging look the same as these textbook bandages. It is only necessary that the bandage does what it is supposed to do.

The following rules may help determine if the bandage is a good one.

1. Do not tie the bandage too tightly, since it may "stop" the circulation of the blood, to other areas and cause serious damages.
2. However, tieing the bandage too loosely may not hold the dressing in place.
3. Since swelling may accompany the injury, the rescuer should check the bandage often and loosen it, if necessary, to prevent the bandage from becoming too tight.
4. When bandaging the arms or legs, leave the fingers and toes exposed, if possible. (If the fingers or toes become pale, it is a sign, that the bandage is too tight.) Pain, pale skin, tingling and a numbness in the area, are all signs of an overly tight bandage.

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PROGRAM D-2
STUDENT NAME
UNIT 03 MODULE 04 TASK 050
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *First Aid Treatment for Shock.*

Objective:

After studying the material, the student will demonstrate and explain the treatment of shock to the satisfaction of the instructor. The student will also answer all review questions accurately.

Introduction:

Shock is a condition that results in a depressed state of the victim's body system and may occur after any accident. No matter how serious the accident, a victim may experience some degree of shock. Shock is a serious condition and may result in the death of the victim. Quick and proper treatment is necessary.

Procedure:

1. Reread the objective.
2. Study the information sheet.
3. Demonstrate and explain the first aid treatment for shock.
4. Answer all review questions.

Review Questions:

1. What is shock?
2. How is shock caused?
3. Name four symptoms of shock?
4. When should the rescuer not elevate any part of the victim?
5. Name three methods to help a victim who is having difficulty breathing.

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REVIEWED & APPROVED RESEARCH JB INSTRUCTOR JB ADMINISTRATION

PREPARED BY: Mr. Alton Hewitt

PROGRAM D-2 UNIT NO. 03 MODULE NO. 04 TASK NO. 050

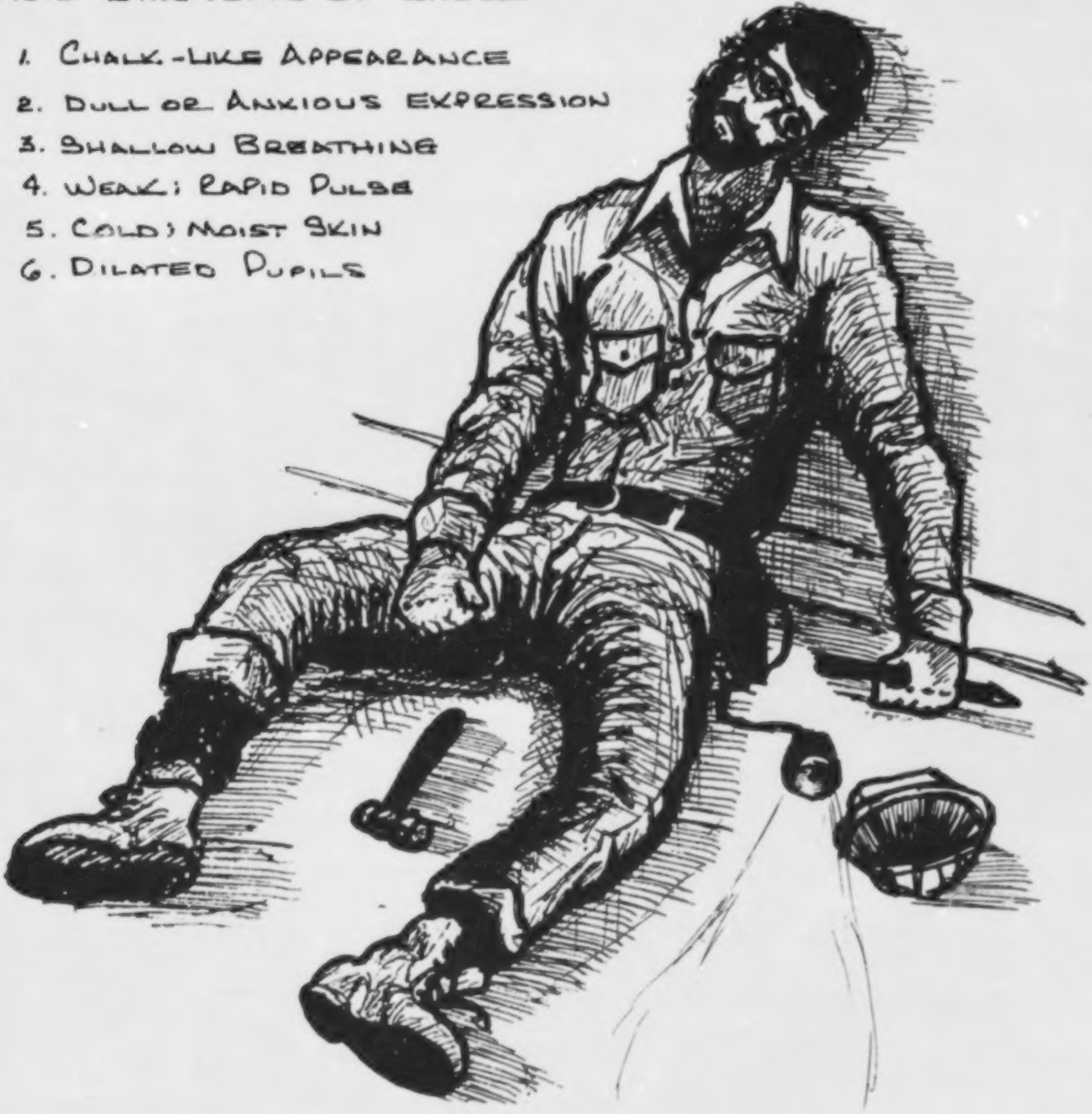
INFORMATION SHEET

Some of the common causes of shock are: severe bleeding, poor circulation of blood, poisoning by chemicals or gases, heart attacks, strokes or severe burns. As you can see, shock can be caused by many different accidents, so the worker should treat the victim for shock after any serious accident.

It is fairly easy to tell if the victim is in a state of shock. (See fig. 1)

FIG. 1 SYMPTOMS OF SHOCK

1. CHALK-LIKE APPEARANCE
2. DULL OR ANXIOUS EXPRESSION
3. SHALLOW BREATHING
4. WEAK; RAPID PULSE
5. COLD; MOIST SKIN
6. DILATED PUPILS



Some of the symptoms or signs of shock are:

1. The skin is pale and cold. (If the victim is dark-skinned, shock can be detected by pale blue skin under the finger nails, under the eyelids or in the mouth.)

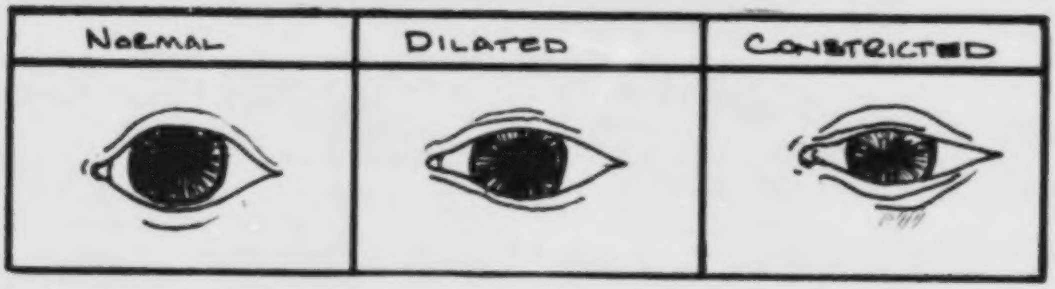
2. The skin may be moist from perspiration.

3. The victim will be very weak.

4. The pulse will be faint and rapid. (It will be easier to find a pulse in the carotid artery of the neck.)

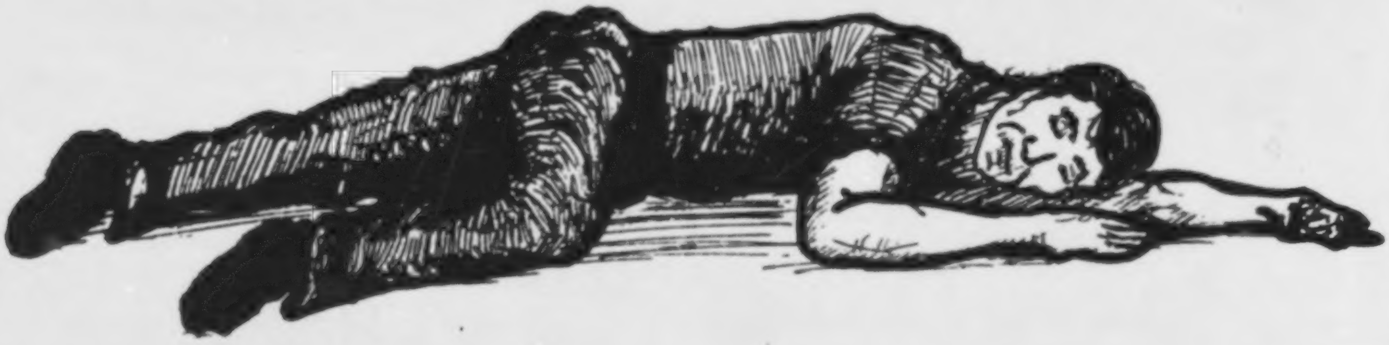
5. The rate of breathing is shallow and faster than normal.

6. The eyes are dull and the pupils are dilated. (In the mine, pupils will normally be open because of the darkness. Try shining a helmet lamp in the victim's eyes. The eyes should constrict quickly. If they do not constrict quickly, the victim is in shock.)



Treatment of shock should take place immediately after the more important injuries have been treated. (Restore breathing and circulation, stop severe bleeding and then treat for shock.)

In treating shock, the position of the victims body is very important. However, if the worker suspects that the victim has a broken back or neck, do not move the victim at all unless necessary. (Fires, explosions, dangerous gases) Minor broken bones should be moved carefully to prevent doing any more damage. An unconcious victim, or a victim with injuries to the lower face or jaw, should be laid on his side to avoid letting any fluid or blood to block his airway.



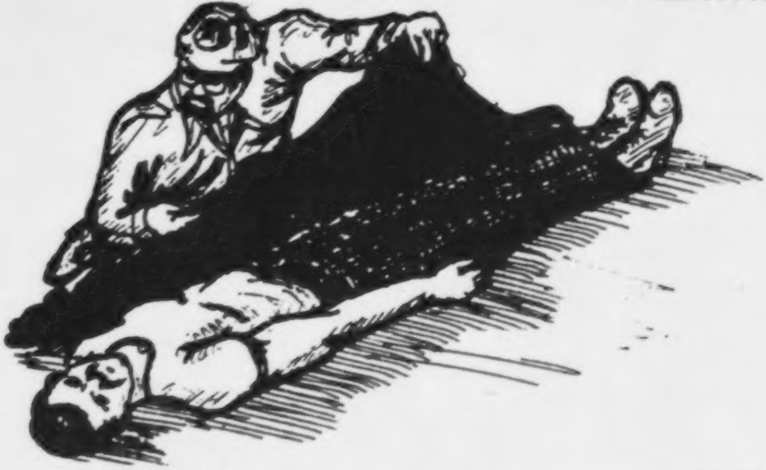
When other head injuries are present the victim can be laid on his back with his head elevated as long as there is no danger of fluid or blood getting into his throat. (Raising the head above the level of the heart helps control bleeding. Raising the head and back will help the victim breath more easily.)

If there is no difficulty breathing and no injuries to the head or upper body, elevating the feet about 8 - 12 inches will help blood circulation. (If the worker is in doubt about which part to elevate, then simply leave the entire body as level as possible, but never permit a bleeding injury to become lower than the heart.)

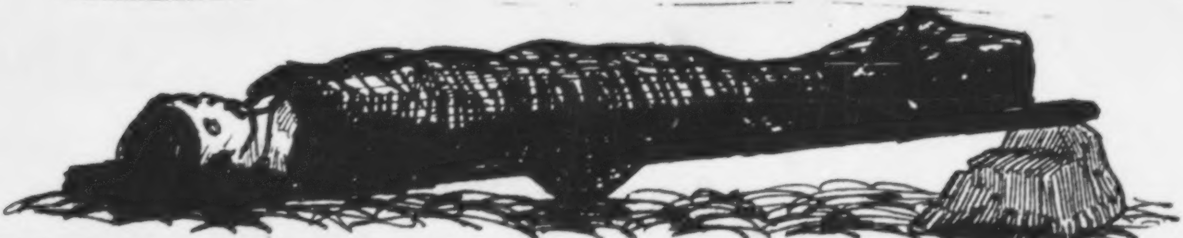
Cover the victim with blankets or clothes to keep him warm and dry, but do not try to raise his body temperature by any other means, since the sudden rise in temperature will only make the shock more serious. It's a good idea to lay the victim on a blanket (plastic if possible), since much body heat may be lost if the victim is positioned on a cold and wet surface.

A victim may complain of thirst, but only give the victim something to drink if it may be a long while before he is in the care of a doctor. The fluid should be warm and only a little given at a time. Never give a drink to an unconcious or semi-concious victim.

TREATMENT FOR SHOCK



1. LAY THE VICTIM FLAT
2. ELEVATE FEET SIX INCHES (IF A STRETCHER IS BEING USED)
3. CLEAR MOUTH OF FOREIGN OBJECTS.
4. LOOSEN CLOTHING.
5. KEEP THE VICTIM WARM AND DRY.



ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2

STUDENT NAME

UNIT 03 MODULE 05 TASK 010

INSTRUCTOR

DATE COMPLETED

INSTRUCTOR'S INITIALS

TASK TITLE: *First Aid treatment for burns.*

Objective:

After studying the material, the student will explain and demonstrate the first aid treatment for different types of burns, to the satisfaction of the instructor. The student will also answer the review questions accurately.

Introduction:

Burns are generally caused by electricity, chemicals or heat. The method used to describe the seriousness of a burn is by degree. For example, a first degree burn is recognized by a reddening of the skin. Sunburn is an example of a first degree burn. Second degree burns involve a deep reddening of the skin and blisters. With reasonable care, second and first degree burns will heal by themselves. However, third degree burns require surgery to replace the damaged skin. Third degree burns will often be open, bleeding wounds with charred or blackened skin (if any skin remains). In this condition, the damage may extend the entire distance to the bone and the bone itself may be charred.

Procedure:

1. Reread the onjective.
2. Study the introduction and information sheet.
3. Demonstrate and explain the first aid treatment for burns.
4. Answer the review questions.

Review Questions:

1. What is a third degree burn?

2. When a victim has been seriously burned, what is the first action taken by a rescuer?

3. Why should ointments not be used?

4. How should chemical burns be treated?

ISSUE 1

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REVIEWED & APPROVED RESEARCH JB INSTRUCTOR ADMINISTRATION JMB

PREPARED BY: Mr. Alton Hewitt & Mr. James DeHaven

5. When should the worker not remove the clothing from a burned area?

INFORMATION SHEET

Severe burns (second and third degree) are very serious injuries. These burns may result in death. However, death is generally caused by shock and infection and may be prevented.

Since serious burns require professional medical aid, the first aid treatment is only meant to prevent infection and shock, (or other serious injuries), relieve the immediate pain and keep air from the wound.

When treating any type of burn, the rescuer must first open the victims airway, check the victim's breathing and circulation and correct any trouble in these two functions. (The treatment may involve CPR and artificial respiration; or it may simply require that the rescuer open the victim's collar and tilt his head back.)

After this procedure has been completed, the rescuer may treat the burn injuries. The method of treating this wound, depends on the cause. (For example, heat and electricial burns are treated differently in the first few steps, than chemical burns.)

Heat & Electrical Burns

1. Cover the victim (except the burn area), since the victim may become chilled.
2. Remove all clothing from the burn area. (If any clothing "sticks" to the burn area cut around that area with scissors and leave that piece attached to the skin. Pulling the clothing free may cause severe bleeding.)

Chemical Burns

1. Wash the burned area with a steady stream of water. (Position the victim, so the burned area is near the bottom. In this position, the stream of water will simply wash the chemical away and not carry it into wounds or exposed areas.)
2. After washing the burned area (water from a lunch bucket will probably be the cleanest water available) remove the clothing that has been touched by the chemical (except any material that adheres to the skin) and wash the wound again.
3. If the chemical has been accidently swallowed read the warning on the chemical's container. The warning will include the substance that should be taken to dilute the chemical (water, milk). Force the victim to vomit only if stated on the warning. Dilute with water, if the container is not available.

PROGRAM D-2 UNIT NO. 03 MODULE NO. 05 TASK NO. 010

The remaining steps for treating burns apply to all forms and causes of burns.

1. Cover the wound with a moist dressing (gauze or bandage material) that has been soaked in clean water (cold water is desirable).
2. Never use grease based ointments, since the ointment must be removed before a doctor can care for the burn. Removing the ointment will cause severe pain and further damage to the victim. (Water soluble burn ointments are available and may be found in first aid kits underground. These may be used if the instructions are carefully read and understood before using the ointment.)
3. If the burned area extends to places of the body that contact other skin surfaces (such as: between fingers or toes, armpits or the groin), separate these areas with moist gauze.
4. Carefully cover all burn areas with bandages and following the instructions included in the task sheet, Bandaging Wounds. Keep all bandages loose enough to prevent them from pressing on the wounds. Since swelling often occurs after the burn, the rescuer must occasionally check the bandages while transporting the victim and loosen any bandages that may have become too tight, due to swelling.

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PROGRAM D-2
STUDENT NAME
UNIT 03 MODULE 05 TASK 020
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *General First Aid Care for Open Wounds.*

Objective:
After studying the material, the student will explain the care of open wounds to the satisfaction of the instructor, by answering the review questions to 100% accuracy.

Introduction:
The skin is the protective covering of the body. The unbroken skin gives the body protection from bacteria and germs. However, germs may enter through any size opening and cause infection. Therefore, any wound that breaks the skin may become a serious infection, if not properly treated. Also, open wounds are often a good sign of internal damage. Proper care of open wounds can minimize the danger of further injury.

Procedure:
1. Reread the objective and introduction.
2. Study the information sheet.
3. Answer the Review Questions.

Review Questions:
1. Why are any open wounds considered a serious injury?

2. Briefly describe all four basic types of open wounds.

3. When may the rescuer "touch" or reach into an open wound?

ISSUE 1
DATE 6/15/77
P 1 OF 2
REVIEWED & APPROVED
RESEARCH MSK INSTRUCTOR ADMINISTRATION
PREPARED BY: Mr. James DeHaven

PROGRAM D-2 UNIT NO. 03 MODULE NO. 05 TASK NO. 020

INFORMATION SHEET

There are four basic types (or classifications) of open wounds.

Abrasions are caused by rubbing or scraping the outer layers of skin away. They are seldom deep and do not always bleed. However, they are likely to become infected, since they expose much area under the protective skin.

Incisions are wounds made with a sharp edge. (Knife, glass, metal, etc.). The wound is cut smoothly and without ragged edges. These wounds bleed freely and are not prone to infection.

Lacerations are similar to incisions. However these wounds have uneven, ragged edges and do not bleed as readily.

Punctures are wounds caused by pointed objects. These wounds have the greatest tendency toward infections, since the germs on the pointed objects are carried deep into skin tissue.

The general first aid care for all of these types of open wounds is basically the same. The purpose of first aid treatment for open wounds is simply to control bleeding and prevent germs from entering the wound. To care for open wounds, these general rules must apply:

1) Rip or cut the clothing so the injury can be seen.
2) Using a sterile gauze, wipe all the loose particles away from the wound. (Never toward the wound.)
3) Never remove any object stuck in the wound, since this object may control some bleeding and tell the doctor the extent of the injuries (how deep, etc.).
4) Do not touch the wound unless necessary and do not use any antiseptics.
5) Place a moist sterile gauze (or compresses) over the wound, so the wound is covered completely. (All compresses placed over an open wound must be moist, to prevent the exposed organs from drying. Clean water is best, but if clean water is not available, urine may be used to moisten the compresses, since urine is fairly sterile and clean.)
6) Bandage the wound properly. (See task sheet on Bandaging and Dressing Wounds.)
7) Treat the victim for shock, treat all other serious injuries and transport the victim to a medical center.

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2 STUDENT NAME ____________

UNIT 03 MODULE 05 TASK 030 INSTRUCTOR ____________

DATE COMPLETED ____________ INSTRUCTOR'S INITIALS ____________

TASK TITLE: *First Aid treatment for chest and stomach wounds.*

Objective:

After studying the material, the student will demonstrate and explain the first aid treatment for chest and stomach wounds to the satisfaction of the instructor. The student will also answer the review questions to 100% accuracy.

Procedure:

1. Reread the objective.
2. Study the information sheet.
3. Explain the steps, while demonstrating the first aid treatment for chest and stomach wounds on a partner.
4. Answer the review questions.

Review Questions:

1. What are the two most common problems found, when bandaging chest wounds?

2. Who may place protruding organs?

3. What is the most common organ that may slip from place, following an open wound?

4. When working underground, where may the worker find clean water for use to moisten dressings?

ISSUE 1 DATE 6/17/77 P 1 OF 4

REVIEWED & APPROVED RESEARCH MSK INSTRUCTOR ____ ADMINISTRATION ____

PREPARED BY: Mr. James DeHaven

PROGRAM D-2 UNIT NO 03 MODULE NO. 05 TASK NO. 030

INFORMATION SHEET

Since the chest and stomach contain most of the body's vital organs, any injury that damages or exposes these organs is extremely serious and may result in death (if not properly treated).

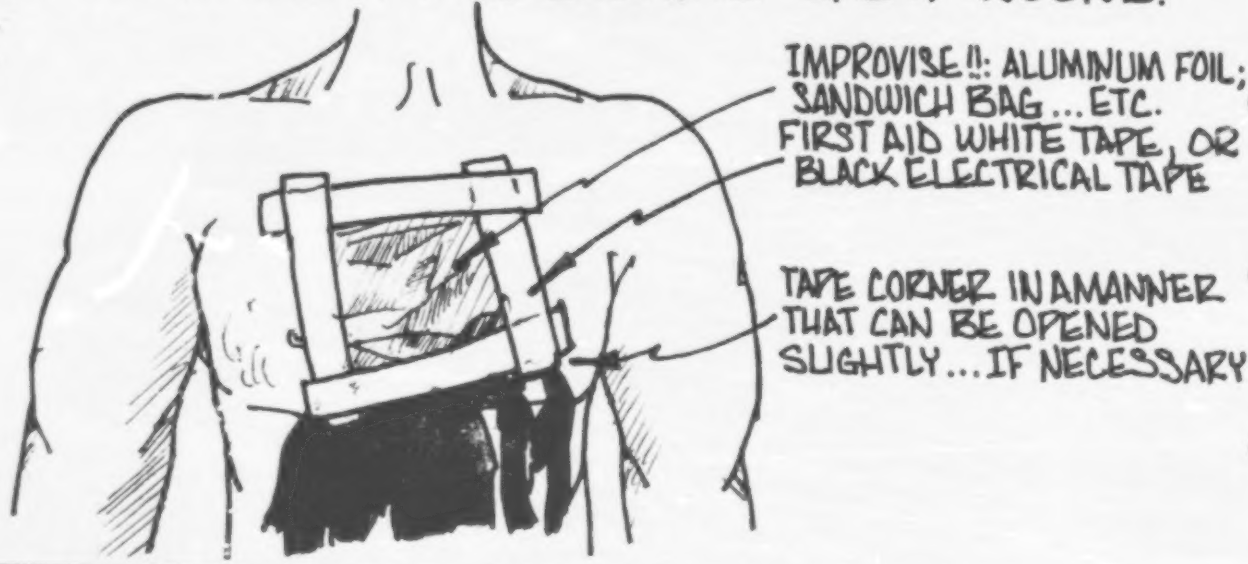
When treating chest and stomach wounds, all general rules for bleeding and impaled objects (objects stuck into the wound) should apply. However, some wounds of the chest and stomach require special treatment, because of their location and special dangers.

For example, one of the most dangerous chest wounds is called a "sucking" chest wound. This wound is simply an opening in the chest cavity, that allows air to enter and fill the cavity. This wound is recognized by a hissing or "sucking" sound produced as the victim breathes. This condition is dangerous, since the air may prevent the lungs from filling properly. The first aid treatment for "sucking" chest wounds is simply designed to prevent any further air from entering the wound.

To seal this wound: 1) locate a piece of plastic wrap, aluminum foil, (try looking in your lunch bucket) or some moist gauze. 2) Cover the wound completely with this material and 3) seal the material by taping it to the skin completely.

However, this seal may cause severe pain and difficulty breathing, by sealing the trapped air inside the victim's chest. If the rescuer notices breathing difficulty, the worker should simply raise a small corner of the seal, to permit the air to escape. (Fig. #1) This particular injury should not be bandaged further and constant attention is necessary. However, all other chest wounds should be dressed and bandaged according to all the general rules of open wounds.

FIG. 1 TREATMENT FOR SUCKING CHEST WOUND.


IMPROVISE!!: ALUMINUM FOIL; SANDWICH BAG ... ETC.
FIRST AID WHITE TAPE, OR BLACK ELECTRICAL TAPE
TAPE CORNER IN A MANNER THAT CAN BE OPENED SLIGHTLY ... IF NECESSARY

PROGRAM D-2 UNIT NO. 03 MODULE NO. 05 TASK NO. 030

The most common problem in treating chest and stomach wounds is: to secure all bandages in a manner that will not interfere with breathing, and to fasten those bandages so they will not slip. As shown in Figure #2, this particular method of bandaging will not restrict breathing, cause any further damage to the victim's injuries and this bandage will stay in place and control bleeding. (Wounds of the upper back can be bandaged successfully, in the same manner.)

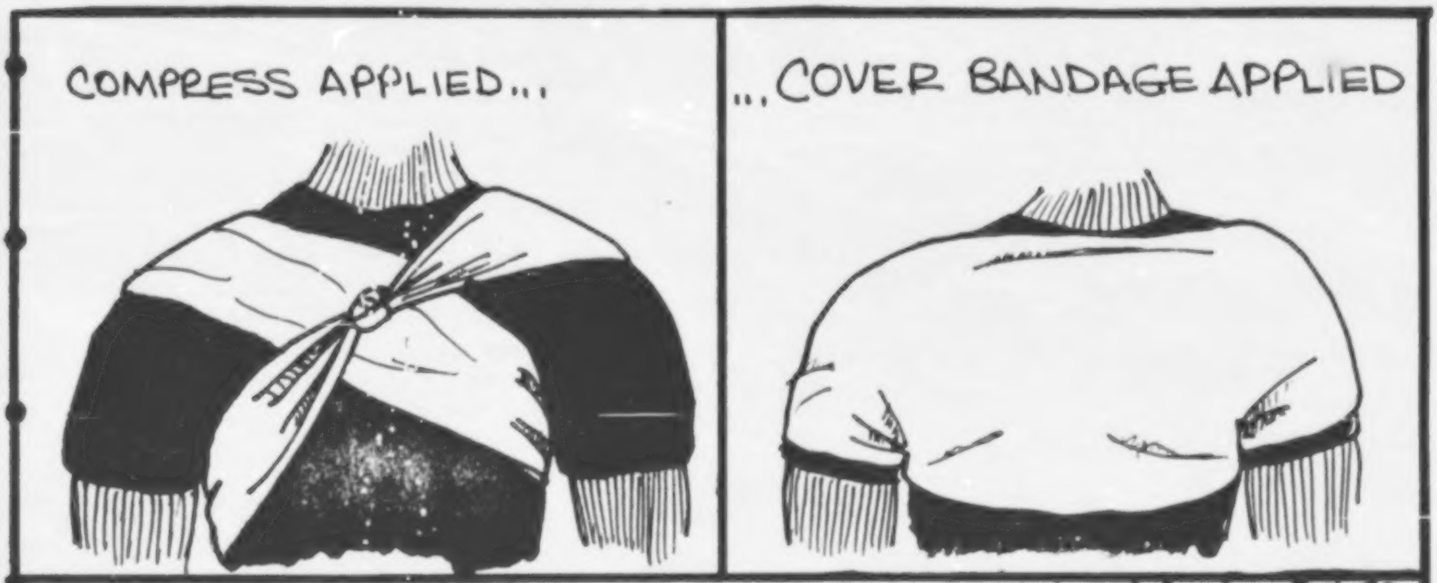


FIG.2 DRESSING FOR WOUND OF CHEST BETWEEN SHOULDERS

Wounds of the stomach or lower back can be bandaged in a method similar to a diaper. (Figure #3) However, open wounds of the stomach present a new problem. Remember, there is no rib-like structure to hold internal stomach organs in place. (The skin is the only protection in this area.) Once the skin has been opened by a wound, the organs may protrude or slide out of their natural position. Since there are many different organs located in the stomach, only a surgeon will know the exact location and position of each organ. Any attempt to replace these organs (by anyone except a doctor) may cause severe damage.

Therefore, when treating protruding organs (the most common stomach injury exposes the intestines), the resucer should simply lay the organs gently against the skin or wounds (as they are found), cover with a moist, sterile dressing and secure them in place with a cover bandage. Extreme care must be taken by the resucer, to avoid rearranging or injuring any of the organs or vessels that connect these organs to other muscles and organs.

PROGRAM D-2 UNIT NO. 03 MODULE NO. 05 TASK NO. 030

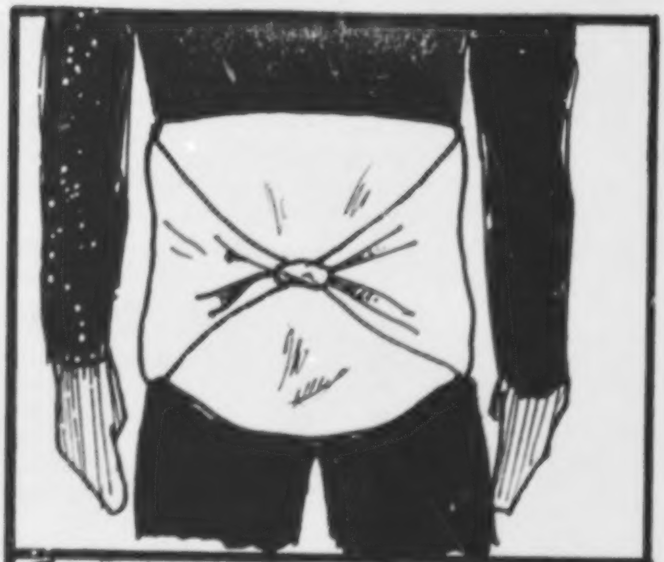


FIG. 3 DRESSING FOR STOMACH WOUND

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
STUDENT NAME
UNIT 03 MODULE 05 TASK 040
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *First Aid Treatment for Eye Injuries.*

Objective:
After studying the information sheet, the student will demonstrate treatment for foreign objects, lacerations and chemical burns of the eyes to meet the instructor's approval and answer all review questions to 100% accuracy.

Introduction:
There are three basic types of eye injuries: (1) foreign objects, (2) lacerations and contusions and (3) chemical, heat and light burns. Eye injuries are extremely serious because of the ever present danger of blindness. Thus, immediate care should be conservative and directed toward getting the victim to a competent physician as soon as possible.

Procedure:
1. Read the objective several times.
2. Read the introduction several times.
3. Study the information sheet and illustrations.
4. Demonstrate the first aid treatments for foreign objects, lacerations and chemical burns of the eyes to the approval of the instructor.
5. Answer all review questions.

Review Questions:
1. If a foreign body is lodged in the eye, where is it most likely to be lodged?

2. Briefly explain the treatment for removing a foreign object.

3. Briefly explain how to treat a torn eyelid.

4. Briefly explain how to treat an avulsed eye.

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INSTRUCTOR
ADMINISTRATION
PREPARED BY: Mr. James DeHaven

5. Briefly explain how to treat a heat burn of the eye.

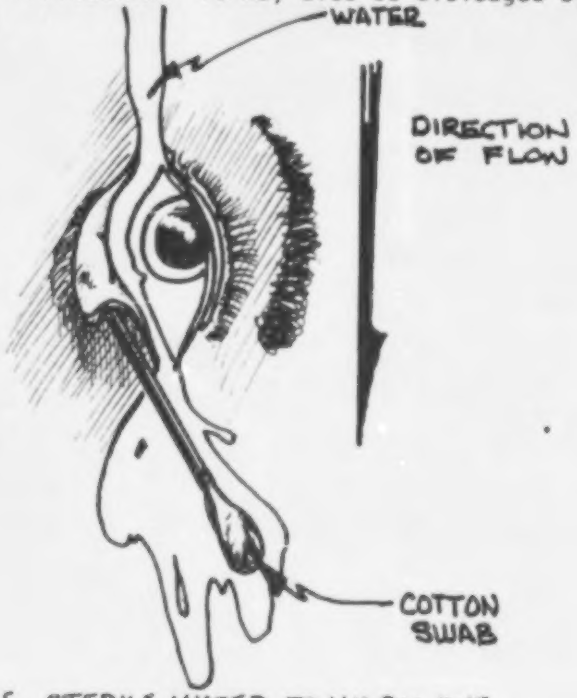
6. Briefly explain how to treat a light burn of the eye.

7. What steps should be taken to protect the eyes of an unconscious victim?

INFORMATION SHEET

Foreign Objects

The most common eye injuries are caused by foreign bodies, such as dirt, sand, cinders, coal, dust or fine pieces of metal, which are blown or driven into the eye and lodge there. Besides being uncomfortable, they can lead to infection. Most foreign objects are washed away by tears caused by the irritation. It may also be dislodged by running water. (See Fig. #1)



- USE STERILE WATER TO WASH EYE
- LET WATER DRAIN DOWN AND AWAY FROM THE EYE

FIG.1 WASHING OUT A FOREIGN OBJECT

Objects that can not be washed away are usually lodged in the underside of the upper lid. Because of the delicate eye tissues, never rub the eye!

Sometimes a foreign object lodged under the upper lid can be removed by clasping the victim's upper lash between your thumb and forefinger and folding the lash upwards over a swab, toothpick or the like at about midline of the upper lid. (See Fig. #2) Once folded, the lid will remain in this position. Have the victim look down. Wash out the object with water or remove it with a cotton swab or the corner of a clean handkerchief.

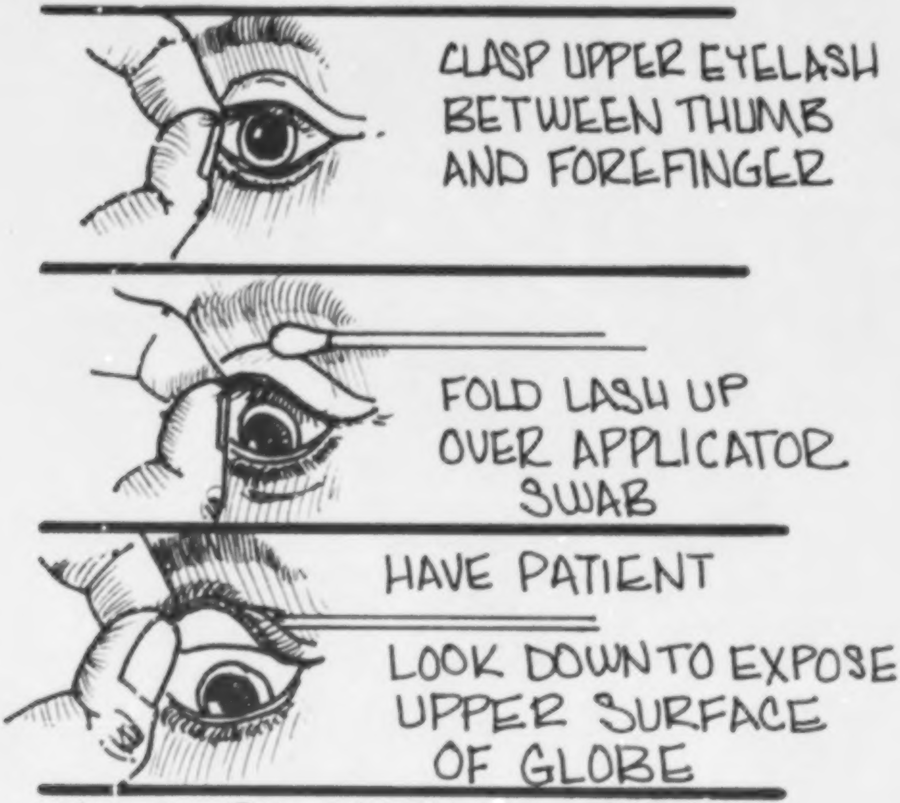
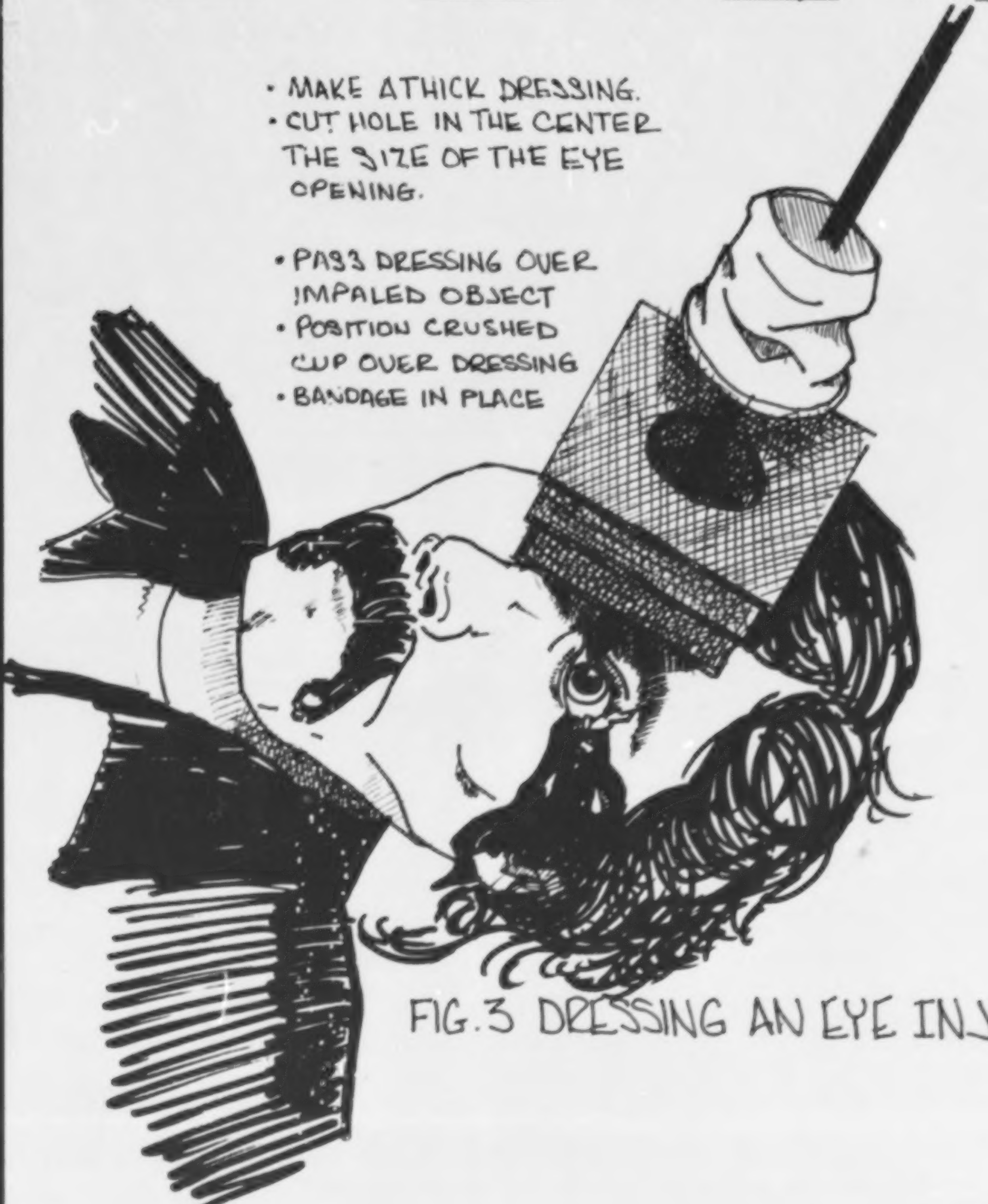

CLASP UPPER EYELASH BETWEEN THUMB AND FOREFINGER
FOLD LASH UP OVER APPLICATOR SWAB
HAVE PATIENT LOOK DOWN TO EXPOSE UPPER SURFACE OF GLOBE

FIG. 2 REMOVING A FOREIGN OBJECT

Large foreign objects should be removed only by a physican. Until then, such objects should be protected from accidental movement. Make a thick dressing using sterile gauze pads or multitrauma dressing. Cut a hole in the center about the size of the eye opening. As shown in fig. #3, carefully position the pad so that it is centered over the injury site. The pad serves as a cushion for a shield to protect the eye. A shield can be made with a cardboard cup or cone. Do not let it touch the impaled object. Position the cup over the cushion, and fasten it carefully in place with self-adherent roller bandage.



- MAKE A THICK DRESSING.
- CUT HOLE IN THE CENTER THE SIZE OF THE EYE OPENING.

- PASS DRESSING OVER IMPALED OBJECT
- POSITION CRUSHED CUP OVER DRESSING
- BANDAGE IN PLACE

FIG. 3 DRESSING AN EYE INJURY

Lacerations and Contusions

Lacerations and contusions are injuries to the soft tissues of the eyes. Outward appearance is no indication of the seriousness of the injury. A laceration of the eyelid may not be as serious as a laceration of the cornea or the sclera although it may appear so. Lacerated eyelids which usually bleed profusely because of the rich blood supply, can be stopped by direct pressure or a pressure dressing. See Fig. #4.

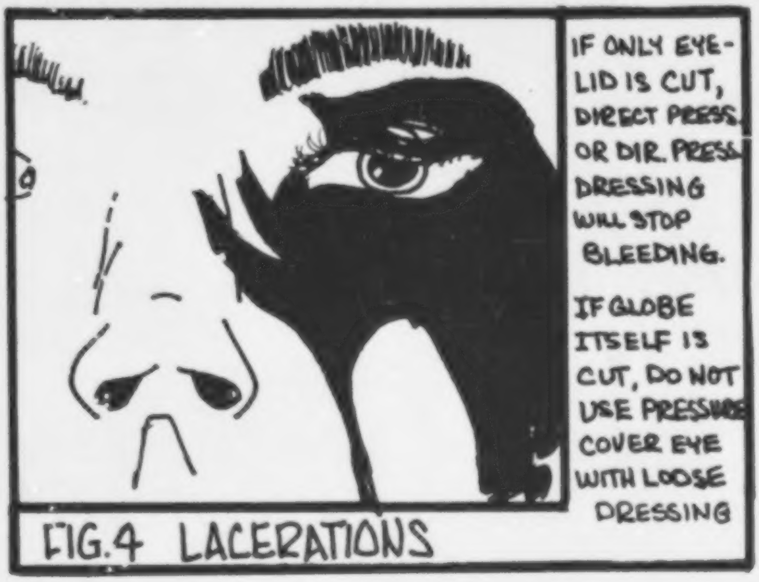

IF ONLY EYE-LID IS CUT, DIRECT PRESS. OR DIR. PRESS. DRESSING WILL STOP BLEEDING.
IF GLOBE ITSELF IS CUT, DO NOT USE PRESSURE COVER EYE WITH LOOSE DRESSING

FIG.4 LACERATIONS

Make sure the globe is not injured, apply pressure. If the globe is lacerated, never use pressure. Cover the bleeding lid with a loose dressing to absorb the blood, aid in clotting and prevent contamination.

Torn eyelids should be handled with care so as to not further the injury. If necessary, they can be covered with a loose dressing. Any fragment of eyelid skin should be kept separately in a dressing in case it is needed to repair the eyelid.

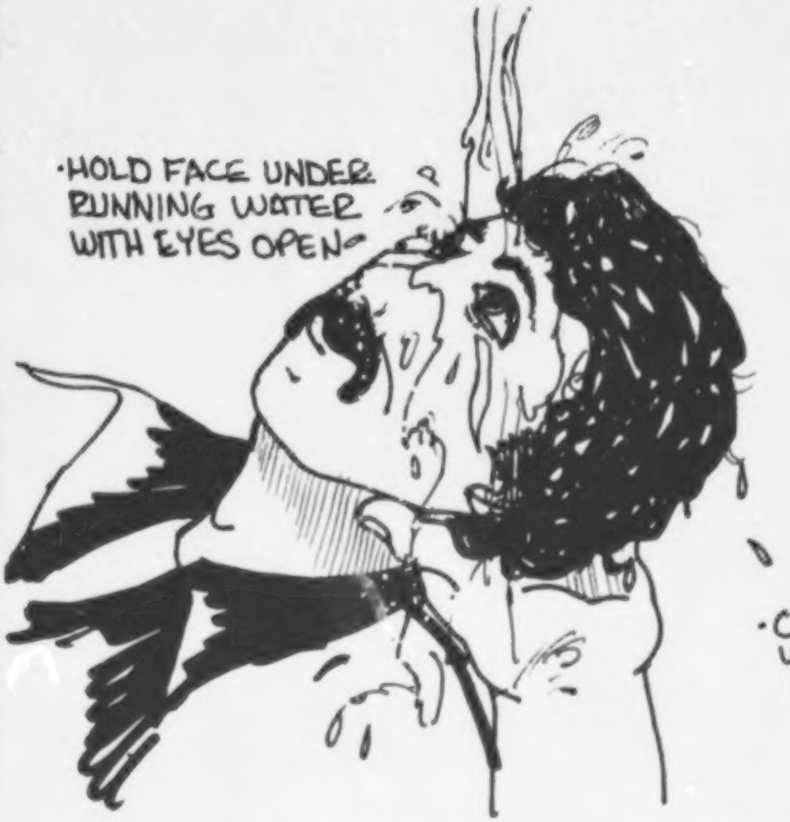
An avulsed eye, one that has been torn from the socket, should be treated in the way as an impaled object.

Chemical, Heat and Light Burns

Immediate care is important for chemical burns of the eyes as irreparable damage may occur. The only treatment possible is to dilute the chemical by flushing the eyes with water, perferably sterile water.

Hold the victim's head face up under running water as shown in Fig. #5. His eyes should be open so the globe and undersides of the lids are thoroughly flushed.

If running water is not handy, hold the victim's face down in a basin of water. He should continually blink his eyes to provide necessary washing action.



•HOLD FACE UNDER RUNNING WATER WITH EYES OPEN

FIG.5 TREATMENT OF CHEMICAL BURNS

•COVER EYES WITH LOOSE, SOFT, MOIST DRESSING

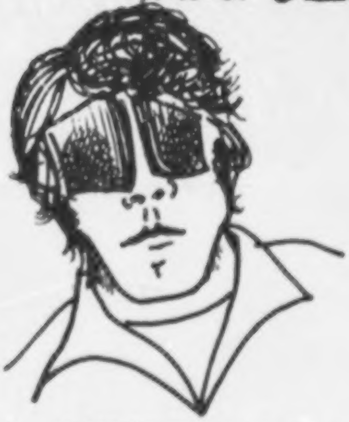


FIG.6 HEAT BURNS

•COVER EYES WITH DARK PATCHES

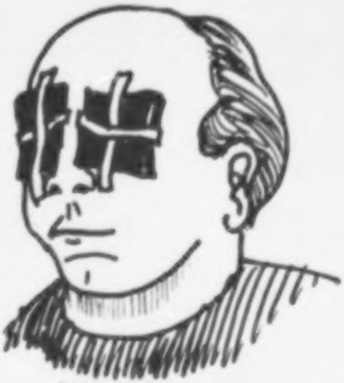


FIG. 7 LIGHT INJURIES

In the case of burnt eyelids, cover with a loose dressing and rush to the hospital. See Fig. #6.

Light injuries, caused by arc flashes or extreme sun rays, can be made less painful by covering with dark patches. See Fig. #7.

Care for an Unconscious Victim
If a unconscious victim has his eyes open, the corneas may dry out and ulcers form. This will cause blindness.

Protect the eyes by maintaining their natural moisture. Keep the lids closed, using tape if necessary. Normal tearing action will keep the globes moist. When taping, careful not to close the globe.

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PROGRAM D-2
STUDENT NAME
UNIT 03 MODULE 05 TASK 050
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *First Aid treatment for broken bones and dislocations.*

Objective:

After studying the material, the student will demonstrate and explain the first aid treatment for broken bones, including recognizing and splinting fractures to the satisfaction of the instructor. The student will also answer the review questions accurately.

Introduction:

Broken bones generally do not mean a life or death emergency. However, anyone who has ever had a broken bone, will testify that it is very painful. In some cases, it may be to the victim's advantage, if the rescuer chose to transport the victim without treating broken bones. But even broken bones can cause additional damage to the victim's conditions. (A fractured bone may cut blood vessels and cause severe bleeding.) For these reasons, a rescuer should be aware of the treatment of broken bones.

Materials:

1. A complete mine first aid kit.

Procedure:

1. Reread the objective.
2. Study the information sheet.
3. Demonstrate and explain the first aid treatment for broken bones.
4. Answer the review questions.

Review Questions:

1. Name four methods of identifying a broken bone.

2. When should the rescuer not treat minor fractures?

3. Why should the fingers or toes not be covered when splinting?

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PREPARED BY: Mr. Alton Hewitt & Mr. James DeHaven

4. How tightly should an air splint be applied?

5. Name three common items that can be found in a mine that may be used as a splint.

INFORMATION SHEET

In most cases, a fracture or broken bone cannot be easily seen and identified. To recognize a broken bone, the rescuer should check for one or more of the following signs.

1. A bone that is sticking through the skin is obviously broken. But the rescuer should also be aware that any accident that could have caused such a violent break would probably break the bone in several places.

2. The information a victim can give the rescuer will help identify a broken bone. For example, the victim may have heard the bone breaking

3. The rescuer may identify any deformed area as being broken by comparing that area of the victim with the same area of his own body. If the areas do not match fairly closely, then it is a good bet that a broken bone is present.

4. Broken bones are almost always painful and the area of the break will be swollen and discolored.

5. If a bone if broken on a movable limb, the victim will probably not be able to move the area. However, the rescuer should not force the victim to demonstrate the loss of movement, since this movement will only compound the pain and damage.

If any of these symptoms are present, the rescuer should assume that the bone is broken and treat it accordingly.

The proper first aid treatment for broken bones is called splinting. A splint is any object which will prevent the fractured area from moving and causing bleeding, pain or other damages. However, the rescuer should remember, that splinting is only a temporary aid and only a doctor may give proper treatment to the fracture.

A good splint is an object, which will prevent the entire bone from moving. Many different types of splints will work, if used properly. (Federal Law #77.1707 requires that splints be located in each section. A worker should be familiar with the location of the first aid equipment and the types of splints that are used in his mine.)

Applying a splint

If the more serious injuries have been cared for, the rescuer may locate and treat broken bones or fractures. Any fracture of the back, neck or hip must be treated with a spinal board (or other similar object), as described in the task sheet concerning spinal injuries. Other fractures may be treated in the following manner.

Fractures of the forearm or lower leg:

To apply a rigid splint to a broken forearm or lower leg, two rescuers are needed. The first rescuer must grab the injured limb above and below the fractured area and straighten gently. The second rescuer should place the splint on the bottom of the limb. (A padded splint is recommended, to prevent any damage to the skin surface.) While the first rescuer maintains his grip on the victims limb, the second rescuer should bandage the limb and splint the two securely together, but not tight enough to interrupt blood circulation. (Always leave the fingers or toes uncovered, so the circulation can be checked regularly. If the skin turns pale blue, the bandage is too tight.) (See Figures #1 and #2).

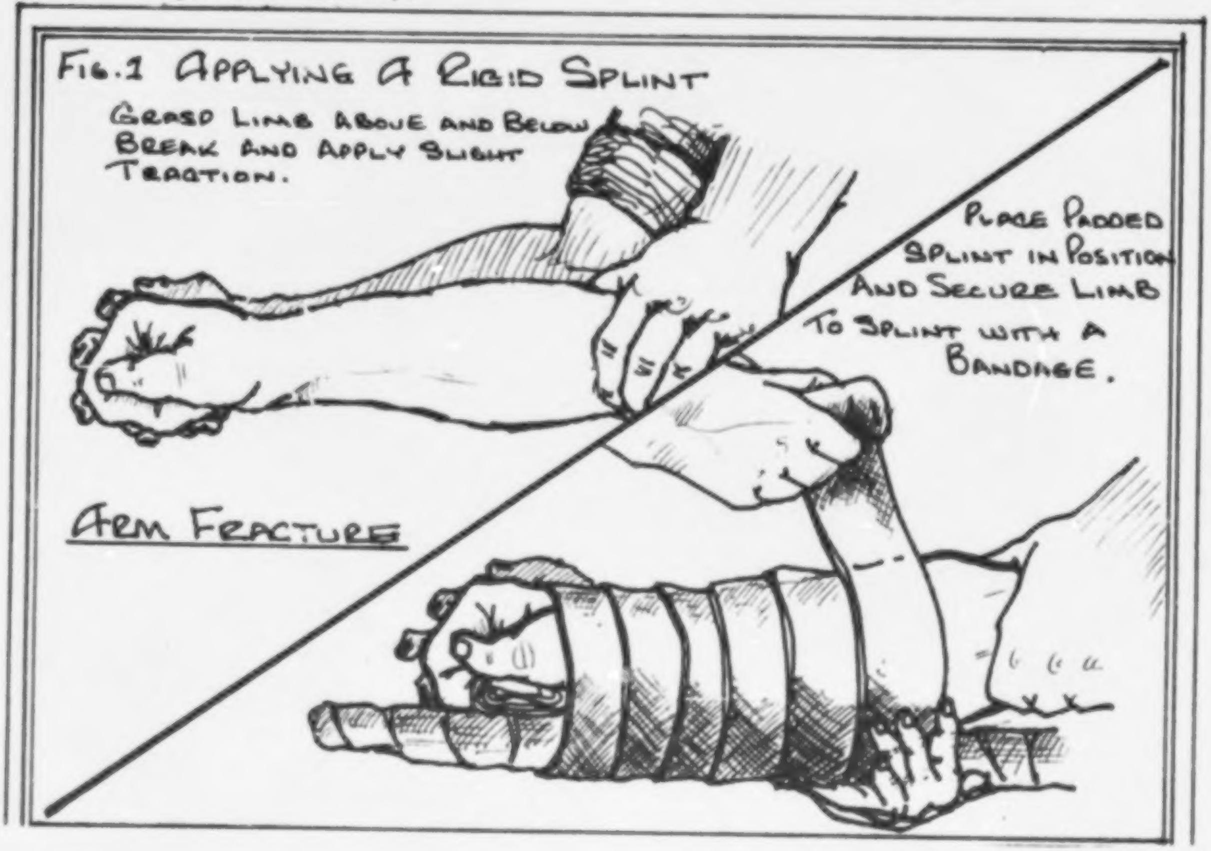


FIG.1 APPLYING A RIGID SPLINT

GRASP LIMB ABOVE AND BELOW BREAK AND APPLY SLIGHT TRACTION.

PLACE PADDED SPLINT IN POSITION AND SECURE LIMB TO SPLINT WITH A BANDAGE.

ARM FRACTURE

FIG. 2 APPLYING A RIGID SPLINT

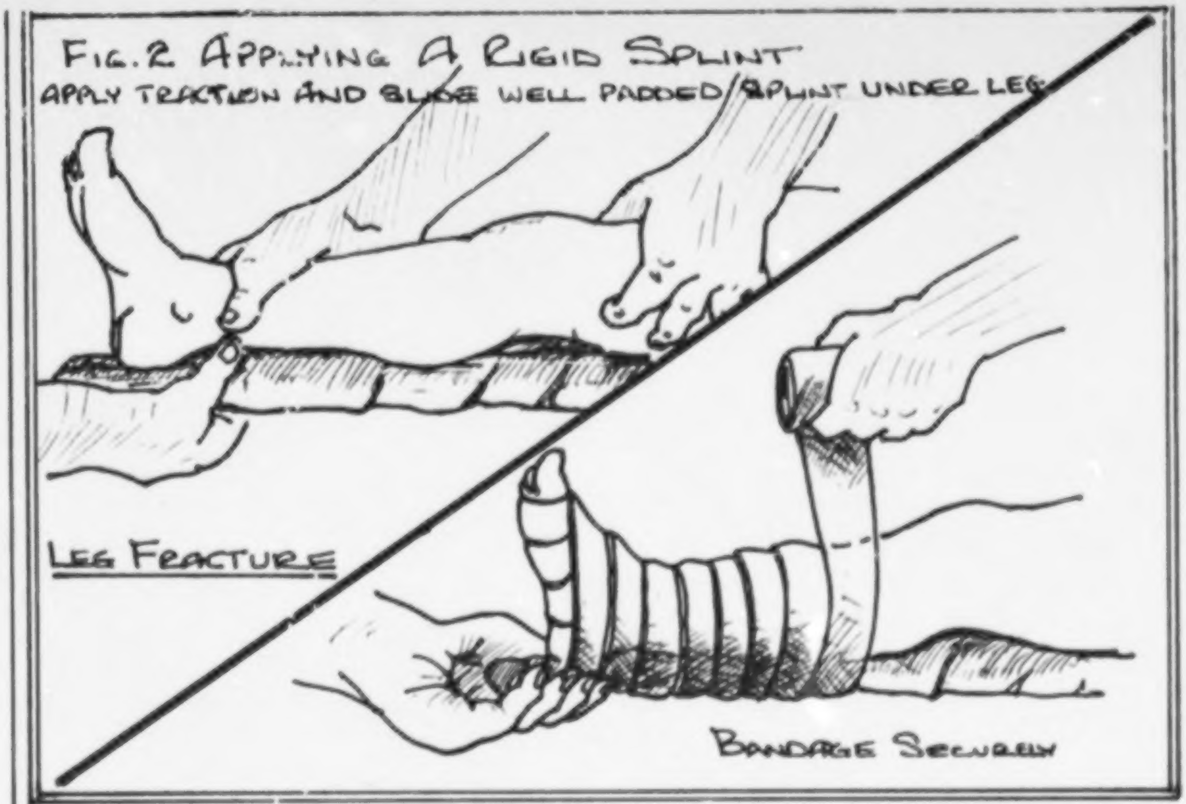
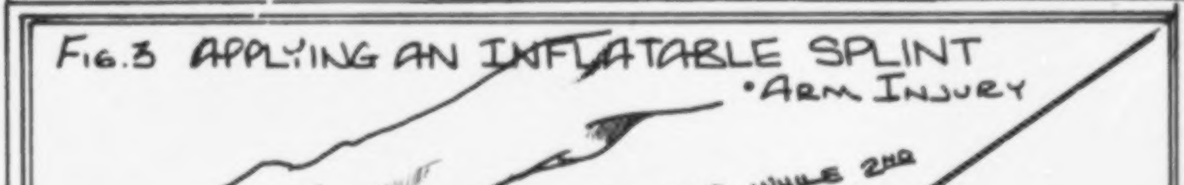

APPLY TRACTION AND SLIDE WELL PADDED SPLINT UNDER LEG
LEG FRACTURE
BANDAGE SECURELY

FIG. 3 APPLYING AN INFLATABLE SPLINT


•ARM INJURY
•GRASP PATIENT'S HAND WHILE 2ND RESCUER GRASPS LIMB ABOVE FRACTURE
FRACTURE OF THE ARM
• GATHER SPLINT ON YOUR OWN ARM
•APPLY TRACTION
• SLIDE SPLINT ONTO LIMB
• INFLATE SPLINT BY MOUTH

To apply an air splint, two rescuers are also needed. The first rescuer should slip the air splint over his own arm and grab the victims hand or foot. (Depending on which limb is going to be splinted.) The second rescuer should grab the victim's limb above the break and straighten the fractured area. The second rescuer may now slide the air splint off the other rescuer's arm and onto the victims fractured limb. Place the air splint evenly across the break, and inflate by mouth. (Do not inflate the splint too tightly, since this will interrupt circulation. Inflate the splint to a point at which your thumb will dent the splint slightly when you press on it.) (See figures #3 and #4)

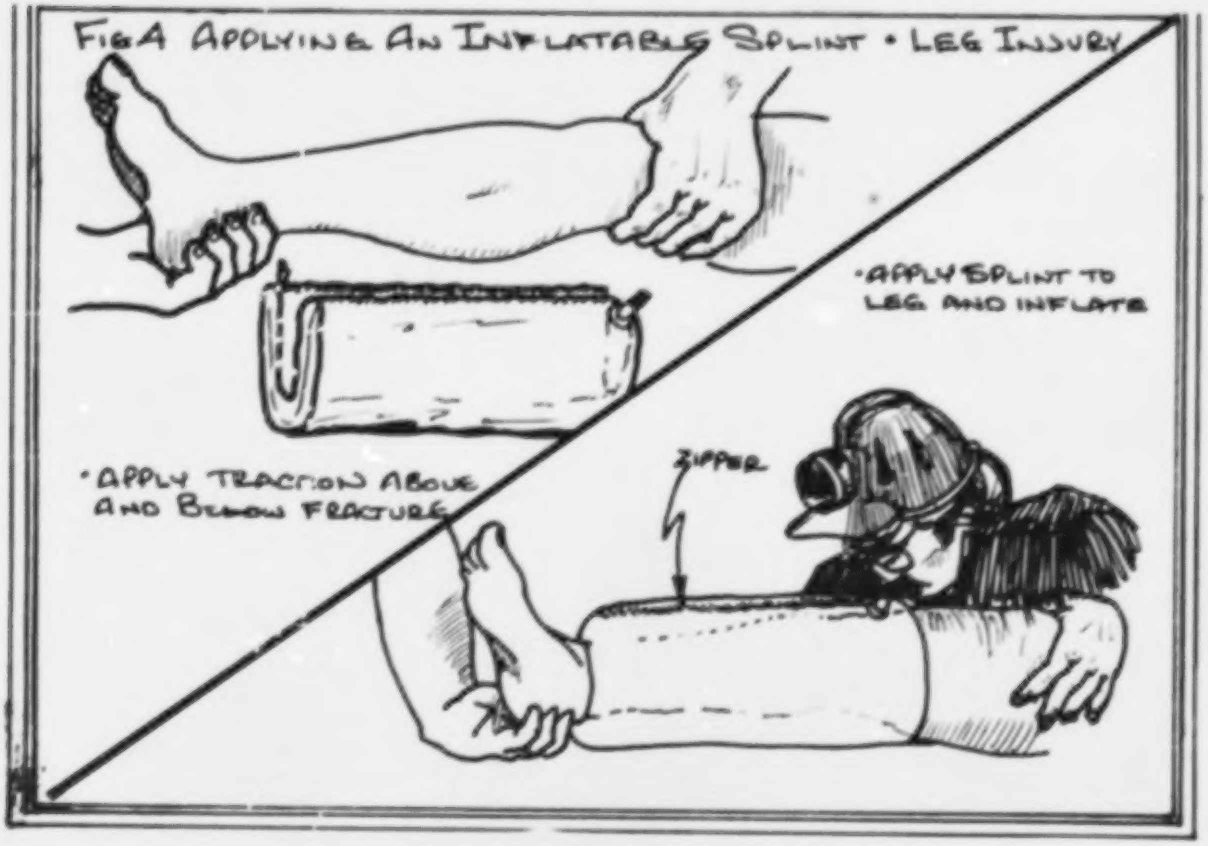


FIG 4 APPLYING AN INFLATABLE SPLINT • LEG INJURY

• APPLY SPLINT TO LEG AND INFLATE
ZIPPER
• APPLY TRACTION ABOVE AND BELOW FRACTURE

Fractures of the upper arm and leg:
Only one rescuer is necessary to apply a splint to a fracture of the upper arm or leg, but the procedures are slighty different.

To splint the upper arm place a short splint (armpit to elbow in length) on the outside of the victim's arm, and wrap the arm and splint together. If possible, place the arm in a sling to prevent the arm from dangling, and separating the fractured bone. (See fig. #5)

Fractures of the upper leg are very painful since, the added weight of the leg itself will cause the bone to dangle and move. To splint the fracture and prevent the rest of the leg from moving and causing more

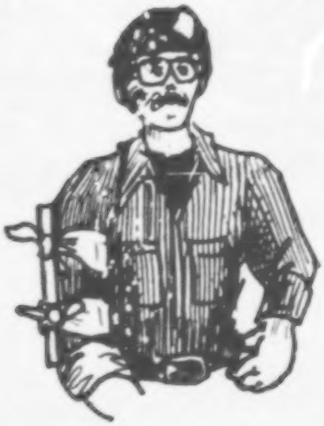


FIG. 5 IMMOBILIZED ARM w/ SHORT SPLINT

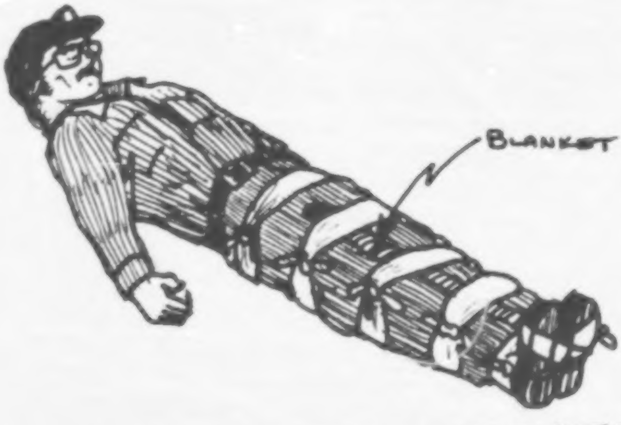


FIG. 6 TYING THE LEGS TOGETHER

pain requires a long splint. Since most mine sections will not have a long splint available, the worker should use any object which will have the same effect. For example, see the method used in Fig. #6. A blanket is folded and placed as a padding between the victims legs. Using roller bandages or some other material (utility belts, strips from a torn shirt, rope, etc.), fasten both legs together. In this method, the victim's other leg is used as a splint.

If available, a spinal board may also be used to secure the leg. Place the victim on the board and pad the area between his legs with a folded blanket. Beginning at the victim's chest, fasten him to the spinal board with the straps or cloth provided. Fasten the area from the victims chest completely down to his feet. But in both methods, try to avoid placing a strap directly on the fractured area of the bone and do not tighten the straps enough to prevent proper blood circulation.

Fractures of the Elbow and Knee

- Injuries to the elbow and knee may be very dangerous if not treated quickly and properly. At these joints, blood vessels and nerves are brought together. Any fracture to the elbow or knee may cause permanent damage to these blood vessels and nerves, so it is important to secure the limb snugly in the position that it was found. (Do not attempt to straighten the limb, if already bent.)

- If the arm is extended when the rescuer arrives, splint the entire arm from armpit to fingertips and follow the basic steps of padding and bandaging. (Use the same splinting procedure for a knee fracture with the leg extended, as you would for a fracture of the upper leg.) (See fig. 7.)

- If the elbow or knee is bent, then place the splint across the arm or leg to complete an "A" figure, with the splint as the center slash. Fasten the limb to the splint without moving the arm or leg, following the same splinting procedures of padding and bandaging as in all splinting procedures. (See fig. 8)

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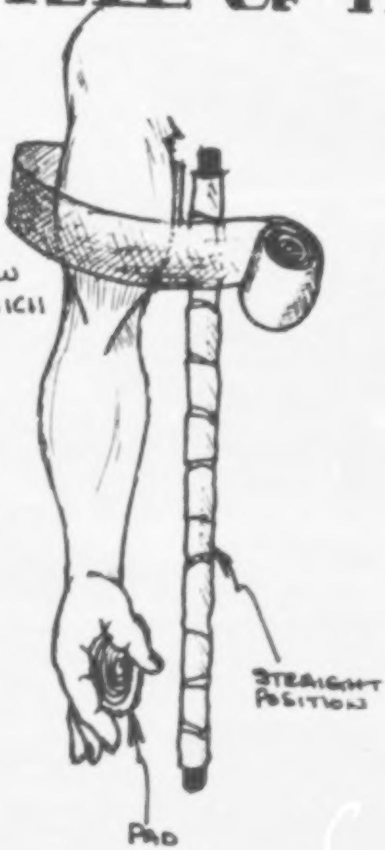
FRACTURE OF THE ELBOW

FIG. 7



- IMMOBILIZE ELBOW IN POSITION IN WHICH IT WAS FOUND.
- THIS METHOD IS ALSO USED IN TREATMENT OF KNEE FRACTURE

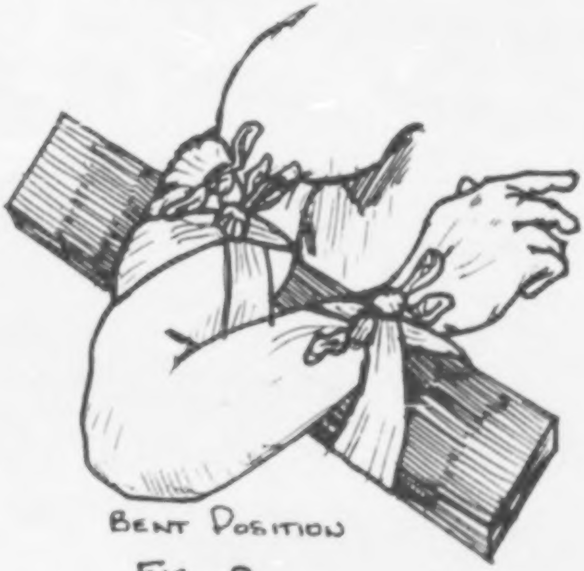


FIG. 8

- If the victims life depends on quick, professional attention (severe bleeding, temporarily stopped by a tourniquet, or difficulty breathing, etc.), the rescuer should transport the victim without treating the minor fractures. However, if back, neck or hip injuries have occurred the rescuer should transport using a spinal board (or similar equipment).

Dislocations

A dislocation is a condition that exists when one or more bones are pulled from a joint. The symptoms of a dislocation are: deformity (the area is not properly shaped), loss of movement, pain and swelling.

The only proper treatment for dislocations is to leave the dislocated area in the position, in which it was found (this will probably be the most comfortable position), and secure the dislocated area in this position (by splints and slings).

For example, Figure #9 shows the proper first aid treatment for a common dislocation - a shoulder injury. In step A, a small pad is placed between the upper arm and the body and a cravat secures the upper arm to the body. To prevent the hanging arm from separating further from the shoulder, a sling is used to keep the arm securely in place.

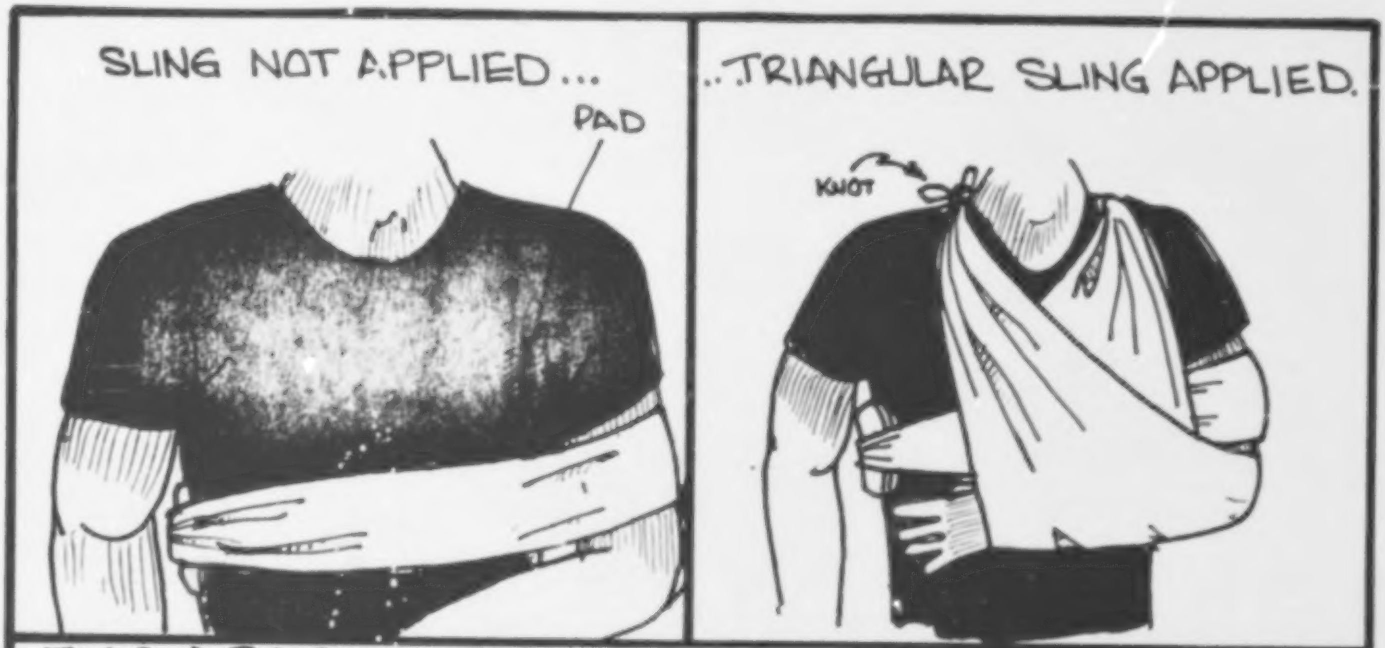

SLING NOT APPLIED...
PAD
..TRIANGULAR SLING APPLIED.
KNOT

FIG.9 DRESSING FOR DISLOCATION OF SHOULDER.

For dislocations of the fingers or toes, the rescuer may attempt to set the bone into place again. To perform this task, the rescuer should simply grab the finger or toe above and below the dislocated area, pull the limb until the joint separates slightly, and gently permit the joint to slip into place. (Be sure to grab the limb above and below the dislocated area, and do not grab beyond another joint. Since, this may cause the second joint to be dislocated as the rescuer pulls back on the limb.)

All other dislocations should be secured in the same position as that dislocation had been found.

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EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
STUDENT NAME
UNIT 03 MODULE 05 TASK 060
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *First Aid Treatment for Rib Fractures.*

Objective:

After studying the material, the student will demonstrate and explain the first aid treatment for rib fractures to the satisfaction of the instructor. The student will also answer the review questions to 100% accuracy.

Procedure:

1. Reread the objective.
2. Study the information sheet.
3. Demonstrate the proper treatment for rib fractures on a partner.
4. Direct any questions, about the material, to the instructor.
5. Answer the Review Questions.

Review Questions:

1. Explain the difference between complicated and uncomplicated rib fractures.

2. Why should the rescuer not bandage a rib fracture, unless necessary to prevent external bleeding?

3. How can the rescuer recognize a punctured lung?

4. Why should the victim of a complicated fracture be positioned with the injured side down?

5. When should the victim of a complicated fracture not be placed in the three quarter prone position?

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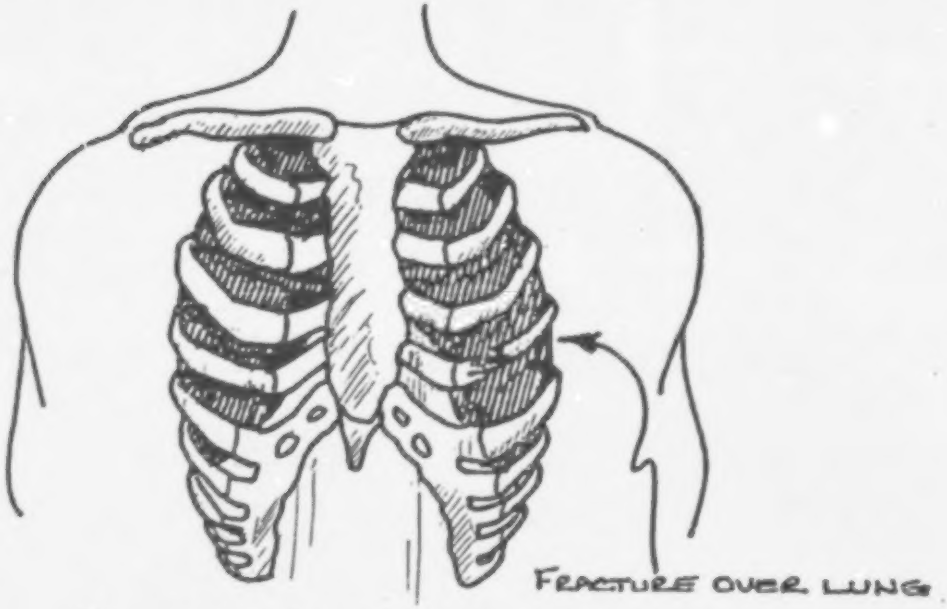
RESEARCH MSK INSTRUCTOR ADMINISTRATION
PREPARED BY: Mr. James DeHaven

INFORMATION SHEET

The rib "cage" is a collection of bones joined at the backbone and sternum to protect the vital organs inside (lungs, heart, etc.). Any rib fracture causes serious pain and may damage the organs inside. These fractures may be caused by a direct blow on the ribs and sternum, or by a severe squeeze.

The ribs are attached to the sternum by cartilage, which is soft in comparison to bone. Any injury may cause the cartilage to break and the rib may be forced into the organs nearby. (Fig. #1)

FIG. 1 FRACTURES OF THE RIBS



CAUTION: DO NOT WRAP THE CHEST

Since, there is a possibility, that further injuries may result from improper treatment of rib fractures, all rib fractures must be treated with extreme care.

To recognize a rib fracture, is fairly simple. Some of the more common symptoms of a rib fracture are: pain, difficulty when breathing, tenderness over the fracture and (when the victim is thin) the fracture may even be seen. If the rib has pierced the lung (complicated fracture), the victim may be coughing and frothy blood may be flowing from the mouth.

The treatment for all rib fractures is:

1) Open the victims shirt and examine the chest for any open wound. (If any open wound is found, treat it as discussed in Chest and Stomach Wounds.)

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2) After the fracture has been located, lay the victim as shown in Fig. #2, with the fractured area near the floor (bottom, etc.) This step will help relieve pain and prevent any internal bleeding from entering the uninjured area of the body.

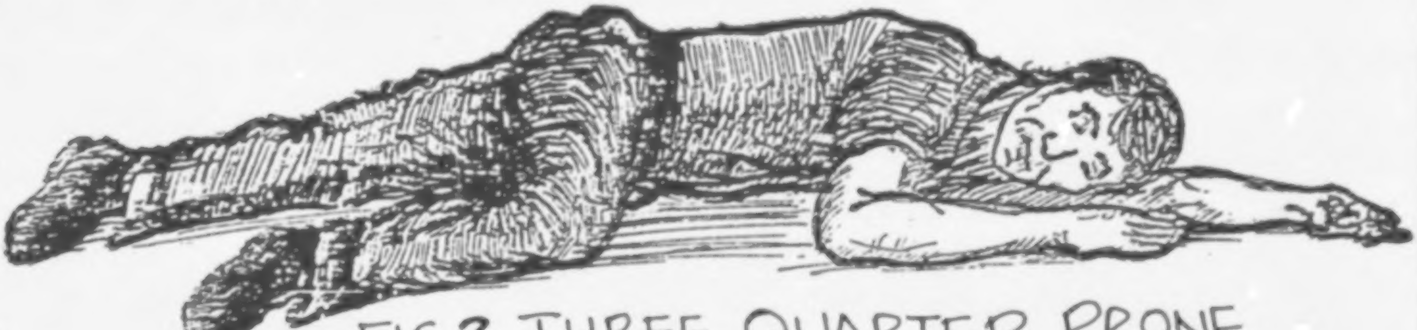

FIG. 2 THREE QUARTER PRONE POSITION

3) Transport the victim in this position. (Do not wrap or bandage the fractured area, unless necessary to control bleeding, since this action may force the fractured rib into the protected organs.

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EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2 ________ STUDENT NAME ________

UNIT 03 MODULE 05 TASK 070 INSTRUCTOR ________

DATE COMPLETED ________ INSTRUCTOR'S INITIALS ________

TASK TITLE: *First Aid Treatment for spinal injuries.*

Objective:

After studying the material, the student will demonstrate and explain the first aid treatment for spinal injuries to the satisfaction of the instructor. The student will also answer the review questions to 100% accuracy.

Introduction:

The spine or backbone is actually a series of connected, small bones. The spine is the major support of the body and also contains the major "nerve" of the body - the spinal cord. Any damage to this cord may cause paralysis, so special care must be taken whenever the rescuer suspects that a spinal injury has occurred.

Procedure:

1. Reread the objective.
2. Study the information sheet.
3. Demonstrate the first aid treatment for spinal injuries on a partner.
4. Explain the steps while demonstrating.
5. Answer the review questions.

Review Questions:

1. What is the danger of spinal injuries?

2. What is the purpose of a spinal board?

3. Name four objects that may be found underground, and used as support for the victim of a spinal injury.

4. Who may remove the victim from the spinal board, once the straps have been properly secured?

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REVIEWED & APPROVED RESEARCH ____ INSTRUCTOR ____ ADMINISTRATION ____

PREPARED BY: Mr. Alton Hewitt & Mr. James DeMagen

PROGRAM D-2 UNIT NO. 03 MODULE NO. 05 TASK NO. 070

INFORMATION SHEET

When the rescuer suspects that the victim has a back, neck or hip injury, special treatment is required when transporting. The only first aid treatment for spinal injuries is careful transportation, since only a qualified doctor may treat injuries to the spine.

When transporting a victim with a spinal injury, the rescuer should remember that any unnecessary movement may cause paralysis, pain and permanent damage to the victim.

The only proper first aid treatment for spinal injuries is to keep the back as straight and stiff as possible. For this treatment a spinal board or a similar stiff, flat object is needed. (See Fig. #1)

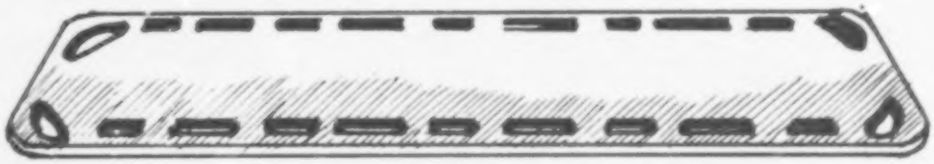
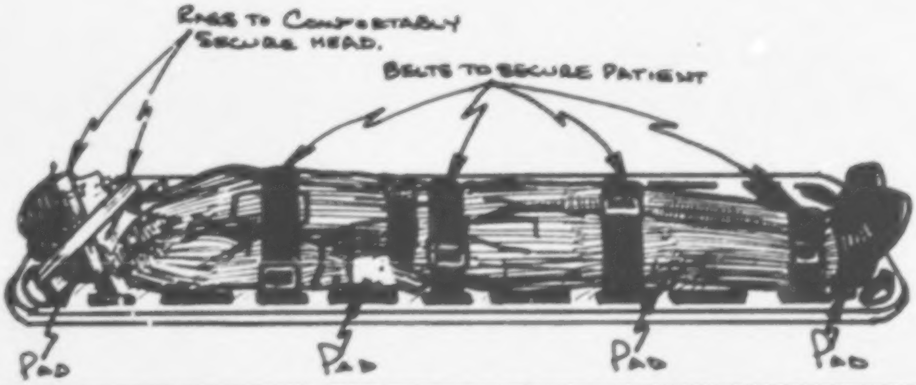


Fig. 1 FULL SPINE BOARD

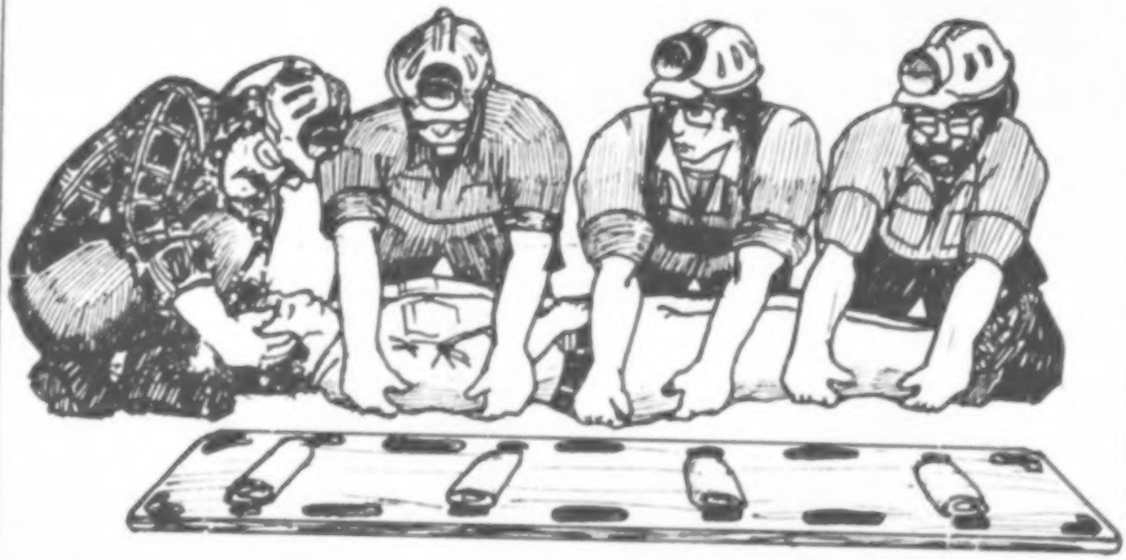
AND WITH PATIENT



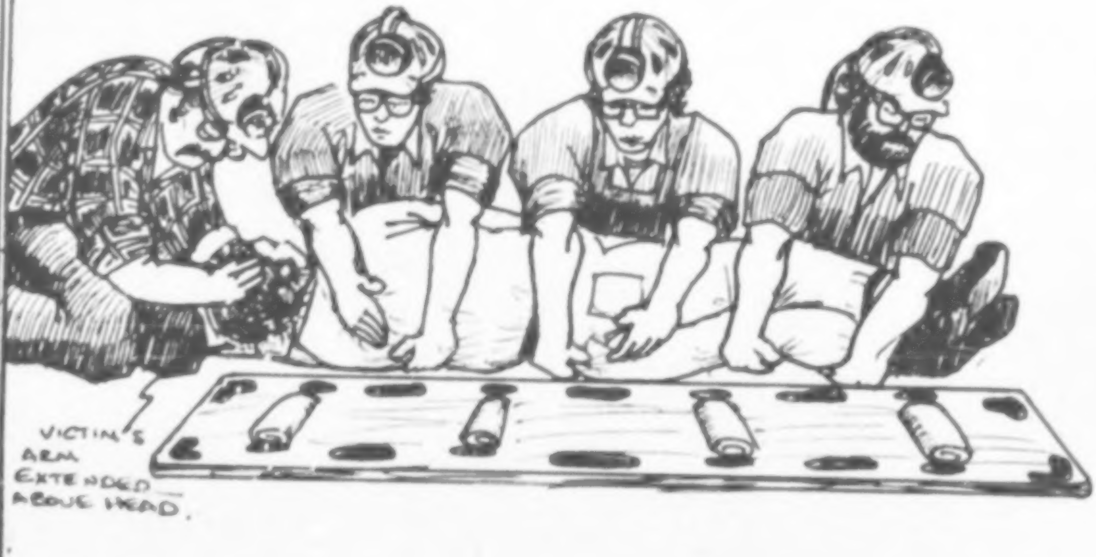
To use a spinal board, the first step is to place the victim securely on the board. This procedure is the most difficult, since moving the victim unnecessarily will cause more damage. The proper movement of a victim

Fig. 2 THE FOUR MAN LOG ROLL

STEP 1



STEP 2



VICTIM'S ARM EXTENDED ABOVE HEAD.

requires at least four rescuers. This step is called a log roll since it involves rolling the victim onto the spinal board.

If the rescue team has four members, three workers kneel at the same side of the victim (one near the victims shoulders, one near the victim's hips and one near the victim's knees). The fourth worker should be at the victims head with each hand on either side of the head to prevent any movement of the neck. (See Step 1 on Figure #2) The first rescuer should raise the arm of the victim that is nearest the other rescuers and lay it beside the victim's head extended, straight up. (To prevent the arm from interfering with the rolling motion.)

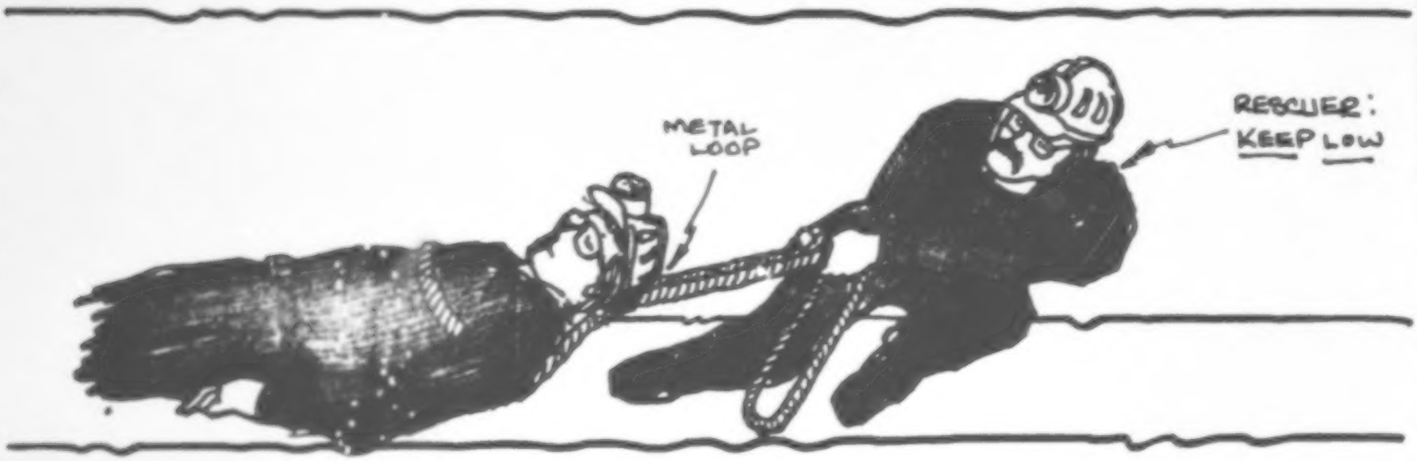
All three rescuers should reach across the victim (the fourth should move the head and the neck in the same direction as the log roll) and grab the victims clothing on his side. At exactly the same time, all rescuers should roll the victim toward themselves. (Be sure to move the victim slowly and evenly.)

The spinal board should be moved under the victim. (If someone else is not there to move the board, the rescuers may have to move it themselves. However, the victim must be kept straight at all times.) (See step 2 of Figure #2) Roll the victim onto the spinal board and place both arms at the victims side. To keep the victim on the board and as stiff as possible, fasten him to the board with the straps that are with the board. (Strapping should be done as shown in Fig. #1).

A victim that is placed properly on the spinal board cannot be injured by movement. If possible, however, don't drag the victim and spinal board. (The rough ride might cause pain.)

If it's necessary to move a victim with a spinal injury before a spinal board can be reached, (Fire, mine gases, etc.), some form of drag must be used. The most common form of drag used for victims with spinal injuries, is called an in-line drag. To perform this drag, the rescuer will need a long section of rope (chain, cable, etc.). This rope must be looped over the victim's chest, through the armpits and under the victims head. (As shown in Fig. #3). The rope must be knotted or fastened together behind the victims head, to support the head and keep it "in-line" with the rest of the body. The rescuer should simply grab both ends of the rope, and drag the victim in this position. If properly performed, this "drag" will prevent the victims head from moving forward or to the side and causing further spinal damage and pain.

FIG. 3 REMOVING VICTIM BY "IN-LINE" DRAG METHOD


METAL LOOP
RESCUER: KEEP LOW

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EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
STUDENT NAME
UNIT 03 MODULE 05 TASK 080
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *First Aid treatment for skull fractures and concussions.*

Objective:

After studying the material, the student will demonstrate and explain the first aid treatment for skull fractures and concussions to the satisfaction of the instructor. The student will also answer the review questions to 100% accuracy.

Introduction:

Some of the symptoms of skull fractures are identical to the symptoms of concussions. And since both injuries are treated (first aid treatment only) in the same manner, these injuries will be discussed together.

Procedure:

1. Reread the objective and introduction.
2. Study the information sheet.
3. Demonstrate the proper treatment for skull fractures and concussions on a partner.
4. Direct any questions, about the material, to the instructor.
5. Answer the review questions.

Review Questions:

1. Why should all head injuries be treated in the same manner as skull fractures?
2. What is the purpose of first aid treatment for skull fractures?
3. Why shouldn't any pressure be placed on the fractured area of the skull?
4. What condition would cause "noisy" breathing?
5. If the victim is unconcious, should he be revived?

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RESEARCH
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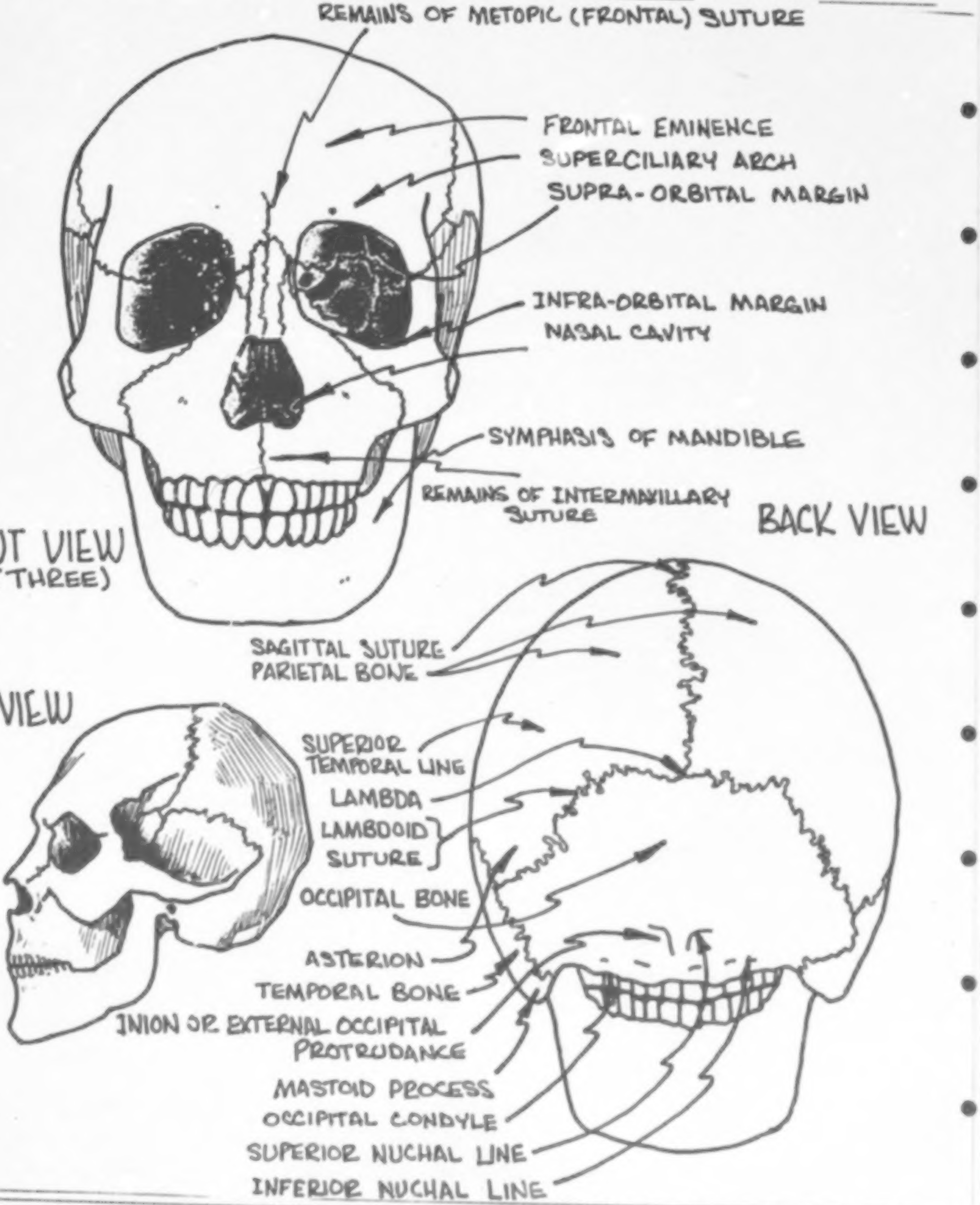
ADMINISTRATION
PREPARED BY: Mr. James DeHaven

PROGRAM D-2 UNIT NO. 03 MODULE NO. 05 TASK NO. 080


REMAINS OF METOPIC (FRONTAL) SUTURE
FRONTAL EMINENCE
SUPERCILIARY ARCH
SUPRA-ORBITAL MARGIN
INFRA-ORBITAL MARGIN
NASAL CAVITY
SYMPHASIS OF MANDIBLE
REMAINS OF INTERMAXILLARY SUTURE
FRONT VIEW (PART THREE)
BACK VIEW
SIDE VIEW
SAGITTAL SUTURE
PARIETAL BONE
SUPERIOR TEMPORAL LINE
LAMBDA
LAMBDOID SUTURE
OCCIPITAL BONE
ASTERION
TEMPORAL BONE
INION OR EXTERNAL OCCIPITAL PROTRUDANCE
MASTOID PROCESS
OCCIPITAL CONDYLE
SUPERIOR NUCHAL LINE
INFERIOR NUCHAL LINE

INFORMATION SHEET

As shown in Fig. #1, the skull is a series of tightly fitted bones, with each joint sealed by cartilage and muscles. The skull protects the brain and any fracture or break in the skull may cause serious damage to the brain. Skull fractures may be present, even, if no visible wounds to the head are present. For these reasons, any head injury should be treated as a skull fracture, if possible.

Two of the signs of a skull fracture are:

1) The victim may be bleeding from inside the nose, ears or mouth.
2) The victim's pupils may be different sizes, which indicates pressure on the brain or damage to the brain. (Also a sign of concussion.)

Any skull fracture or concussion must be treated by a doctor. The first aid treatment (in this case) is only meant to transport the victim with no further damage.

To provide proper first aid treatment for a victim of a skull fracture or concussion, the rescuer should:

1) Keep the victim lying down, with the head supported by a folded blanket or shirt.
2) Locate the fractured area visually, if possible. (If it is not possible to see the fractured area, gently "run" your hand across the skull and feel for any abnormal shape in the skull. But do not press on any section of the skull.)
3) If any open wound is present, control the bleeding and bandage the wound. Tie all knots in the bandage away from the fractured area and be sure the bandage is not overly tight.
4) Treat the victim for shock.
5) Listen to the breathing of the victim. If the breathing is not making "gurgling" or "bubbling" noises, lay the victim on his back. If breathing is noisy, lay the victim as shown in Fig. #2.

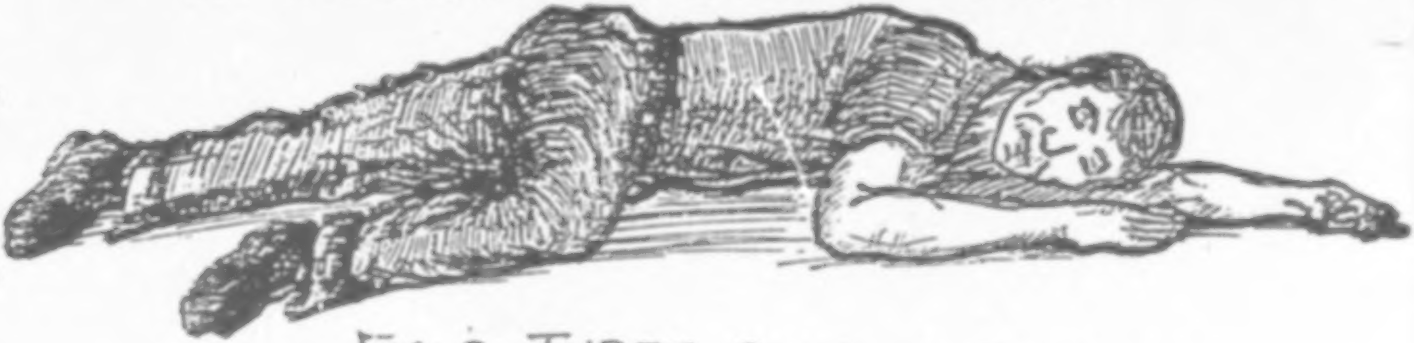


FIG. 2. THREE QUARTER PRONE POSITION

6) Turn the victim's head to the side. If blood is coming from one ear, position the body so the ear will be near the bottom (so it may drain). However, under no conditions should the victim be placed in a position, where the fractured area is laying against

any solid object. (The floor, the rib, etc.)

7) Transport the victim on a stretcher in the same position. Carefully watch and care for the victim during transportation. Avoid all unnecessary movement while transporting.

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PROGRAM D-2
STUDENT NAME
UNIT 03 MODULE 05 TASK 090
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *First Aid Treatment for Sprains and Strains.*

Objective:

After studying the information sheet, the student will demonstrate and explain the first aid treatment for sprains and strains to the satisfaction of the instructor and answer the review questions to 90% accuracy.

Introduction:

Because sprains and strains show basically the same symptoms as fractures, if there is the slightest doubt, treat as if they were known fractures.

A dislocation usually results in a deformity at the joint, while a sprain or strain causes no such deformity.

Procedure:

1. Read the objective several times.
2. Read the introduction at least twice.
3. Study the information sheet and illustrations.
4. Practice each procedure on a dummy or a partner to meet the satisfaction of the instructor.
5. Answer all review questions.

Review Questions:

1. What is the difference between a sprain and a strain?

2. What are the three main signs of a sprain?

3. Briefly describe how to treat a sprain.

4. What is the only sign of a strain?

5. Briefly describe how to treat a strain?

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REVIEWED & APPROVED
RESEARCH
INSTRUCTOR
ADMINISTRATION

PREPARED BY: Alton Hewitt

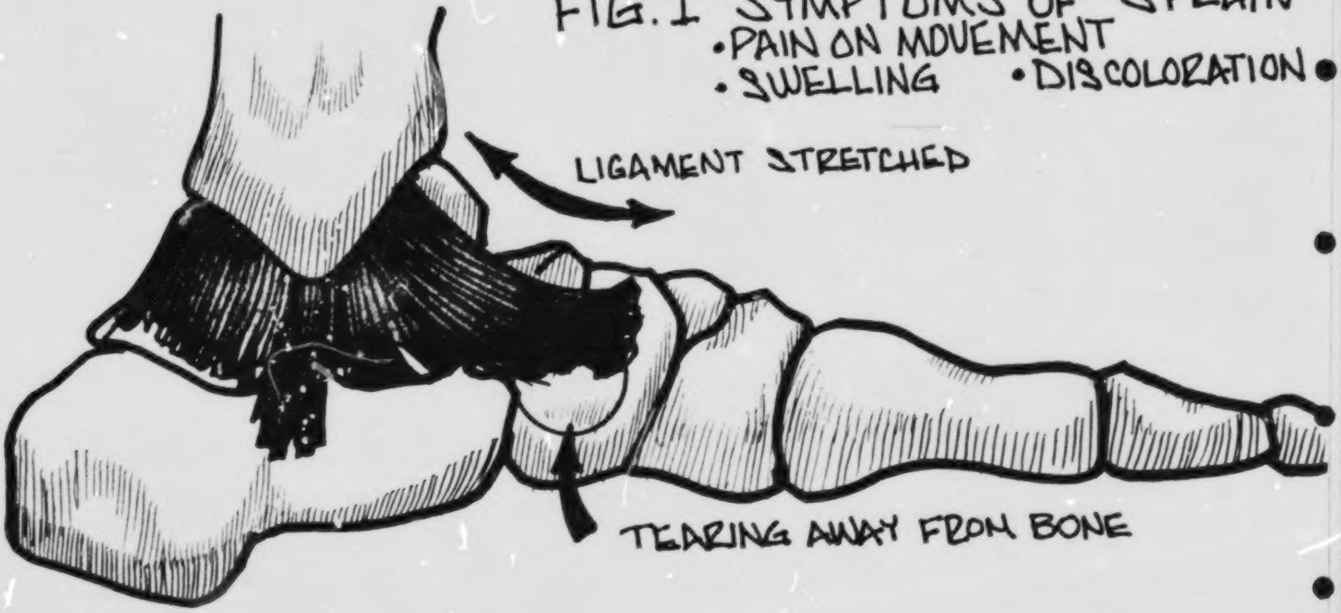
INFORMATION SHEET

Sprains

Sprains are injuries due to stretched or torn ligaments or other tissues around a joint. They are caused by a sudden twist or motion forced beyond the normal range of the joint. Sprains range from minor injuries which cause discomfort for only a few hours to severe cases where tearing of the tissues require weeks of medical care to be restored. The ankles and knees are most often affected by sprains. For example, anke sprains are the result of the body weight thrown against a turned ankle.

The symptoms of sprains are pain around the joint, especially with movement, rapid swelling and discoloration. See fig. 1.

FIG.1 SYMPTOMS OF SPRAIN
- PAIN ON MOVEMENT
- SWELLING
- DISCOLORATION



To treat a sprain, first place the joint at absolute rest in an elevated position. Then, to relieve the pain, use cold applications, such as ice packs or compresses wrung out in cold water for the first 24 hours, then apply warm compresses for the second 24 hours. Do not rub. An x-ray examination will determine the extent of the injury

Strains

Strains, often confused with sprains, is the overstretching of a muscle or a muscle tendon caused by sudden movements or violent exertion in improper lifting or moving heavy weights. In severe strains, usually involving the back muscles, the fibers forming the muscle or tendon may be torn.

The only sympton of a strain is a sharp, intense pain or cramp immediately. Attempts to use the muscle are painful and difficult. Moderate swelling may result. See fig. #2.

PROGRAM D-2 UNIT NO. 03 MODULE NO. 05 TASK NO. 090

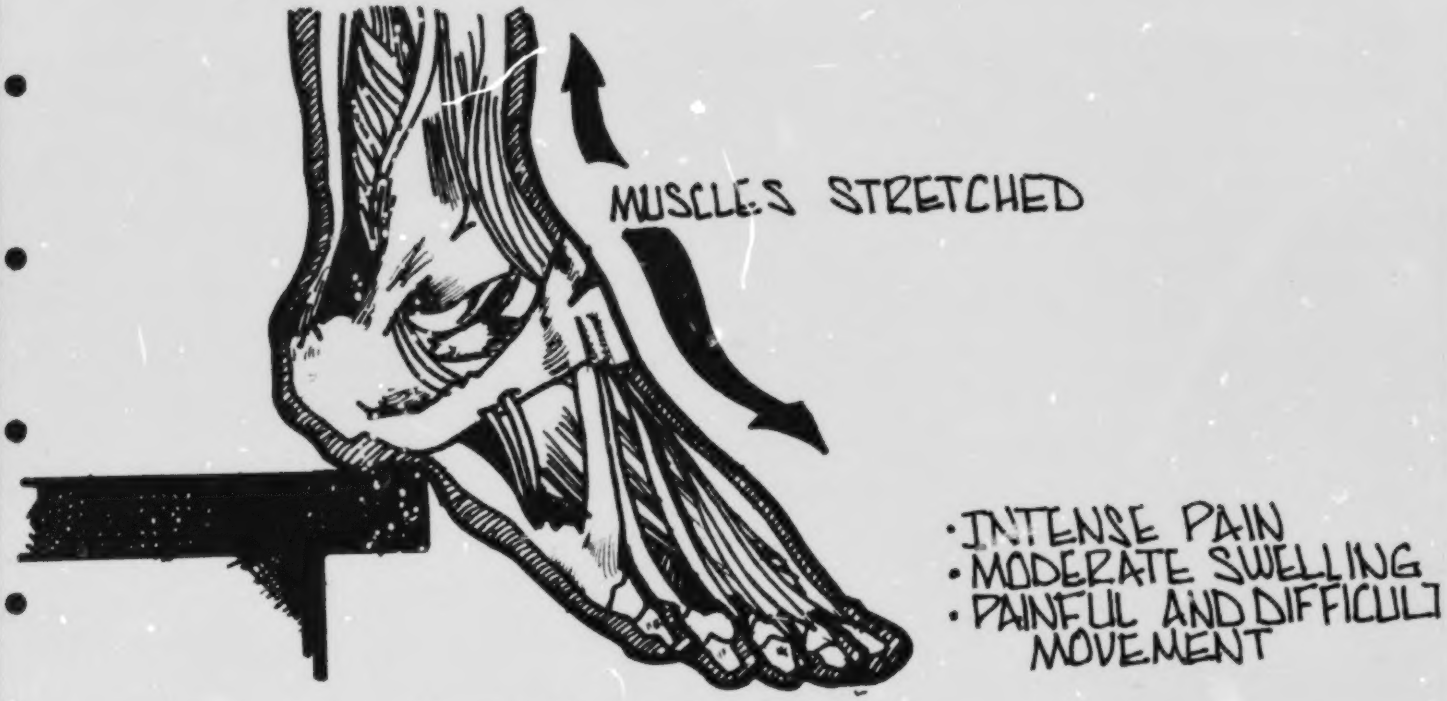

MUSCLES STRETCHED
• INTENSE PAIN
• MODERATE SWELLING
• PAINFUL AND DIFFICULT MOVEMENT

FIG. 2 SYMPTOMS OF STRAIN

Treat a strain in the same manner as a sprain:

1. Immobilize and elevate.
2. Apply cold compresses for the first 24 hours (avoid exposure).
3. Apply warm compresses for the second 24 hours.
4. Do not rub.

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PROGRAM D-2
STUDENT NAME
UNIT 03 MODULE 05 TASK 100
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *First Aid Treatment For Stroke.*

Objective:

After studying the information sheet, the student will demonstrate and explain the first aid treatment for stroke to meet the instructor's approval and answer all review questions to 100% accuracy.

Procedure:

1. Read the objective several times.
2. Study the information sheet.
3. Demonstrate the first aid treatment for stroke on a dummy or partner to meet the instructor's approval.
4. Answer all review questions.

Review Questions:

1. Define stroke.

2. What causes a stroke?

3. Briefly describe the symtoms of a stroke.

4. Briefly describe the treatment for a stroke.

5. Why should the ambulance sirens and high speeds be avoided when transporting the victim?

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REVIEWED & APPROVED RESEARCH INSTRUCTOR JDD ADMINISTRATION JMB

PREPARED BY: Mr. James DeHaven

INFORMATION SHEET

A stroke occurs when the blood supply to part of the brain is cut off, impairing the functions of the cells in that part of the brain and (brain cells will die if they are deprived of oxygen for four minutes or more) the part of the body which those brain cells control. The result may be difficulty in speed and movement or loss of memory. Depending on which brain cells damaged, the effects can be slight to severe, permanent or temporary.

There may be several causes of a stroke, but regardless of its cause, a stroke is generally quite sudden. Usually the victim's face is flushed and warm, but sometimes it may appear ashen gray. Respiration at first is slow and of the snoring type and later rapid and weak. Each time he exhales, his cheeks and lips puff. The size of the eye pupils are unequal and usually one eyelid droops. One side of the body usually suffers a weakness or paralysis.

To treat a stroke, first assure an open airway. The victim should be lying down with his head raised so as to relieve some of the blood pressure in the damaged area. The victim should be kept quiet and not moved more than absolutely necessary. Do not give anything by mouth. Do not apply stimulants or artificial heat to the body. Apply cold applications if available. If the victim has difficulty breathing, oxygen inhalation can be applied by a trained person.

Obtain medical care immediately. When transporting by ambulance, high speeds and the use of the siren should be avoid.

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PROGRAM D-2 STUDENT NAME

UNIT 03 MODULE 05 TASK 110 INSTRUCTOR

DATE COMPLETED INSTRUCTOR'S INITIALS

TASK TITLE: *First Aid Treatment For Heart Attack.*

Objective:

After studying the information sheet, the student will define a heart attack and its symptoms and explain the treatment for a heart attack by answering all review questions correctly.

Procedure:

1. Read the objective at least twice.
2. Study the information sheet.
3. Answer all review questions.

Review Questions:

1. Define heart attack.
2. Briefly describe the symptoms of a heart attack.
3. Which position should the victim be in?
4. Briefly describe the treatment for a heart attack victim.
5. Briefly describe how to transport a heart attack victim.
6. Briefly describe how to administer nitroglyserin tablets.

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REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. James DeHaven

7. Briefly describe how to administer amyl nitrite ampoules.

8. Briefly describe the procedure to use when the heart attack victim is in shock.

INFORMATION SHEET

A heart attack is the sudden blocking of the cornary arteries that normally supply the heart muscles with blood. It usually occurs in older persons. Although very painful, most heart attacks do not produce instant death.

The victim may go into a state of collapse and unconsciousness may occur at the onset or later in the attack. Severe, heavy pain starts in the front part of the chest and radiates to the shoulder, back, jaw, the arms and into the fingers. Numbness may occur in the affected area. Because of the decreased supply of blood to the lungs, shortness of breath is a usual symptom. The face will probably be pale and show fright and the eyes open wide. The victim may be active and restless, perspire profusely and may vomit. Some victims go into shock, but the pulse does not indicate the degree of shock.

Since the victim will demand medical care, the best treatment for him until a doctor can arrive is to make every effect to prevent additional strain on his heart. The victim may want to lie down, but a semi-reclining position is prefered. See Fig. #1.

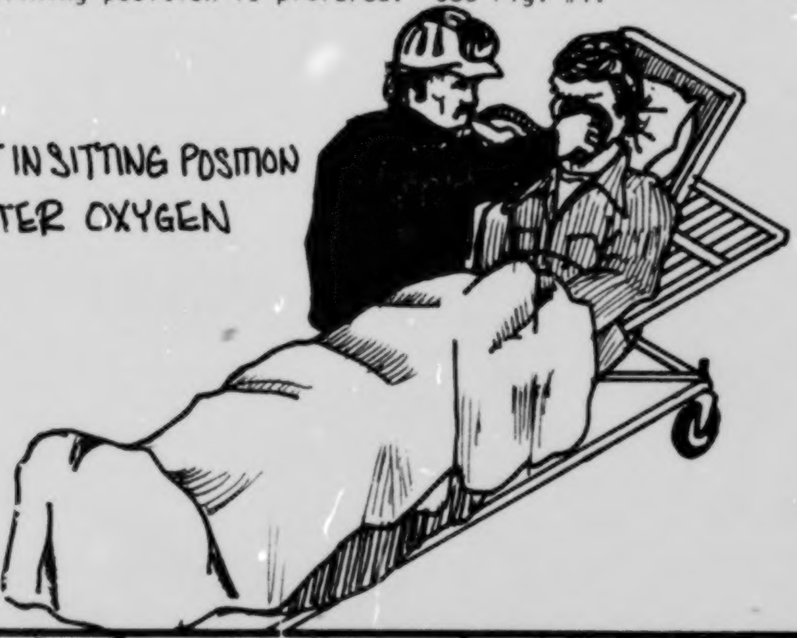

FIG. 1 CARE FOR THE HEART ATTACK PATIENT

PROGRAM D-3 UNIT NO. 03 MODULE NO. 05 TASK NO. 110

Give him plenty of air and if available, have a trained person administer oxygen therapy. It is important to maintain an open airway. If respiration stops, immediately apply artificial respiration. The victim should not be moved, unless in danger, until a physician arrives.

If the victim is carrying nitroglyserin tablets, place a tablet under his tougue. If he has amyl nitrite ampoules (perles), break onc in the folds of a handkerchief and hold it under his nose.

Loosen clothing. The victim most likely will be apprehensive and frightened from the pain and danger involved. Give him encouragement and try to relax him. Never attempt to take the victim to the hospital, except by ambulance. It is important that he be kept at rest. Transport him in a seated positon on the cot.

The care of a heart attack victim in shock differs from the usual procedures: (1) conserve body heat by using a blanket, but do not make the victim too warm; (2) place the victim in the most comfortable position.

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PROGRAM D-2
STUDENT NAME
UNIT 03 MODULE 05 TASK 120
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *First Aid treatment for Diabetic Emergencies.*

Objective:

After studying the material, the student will explain the first aid treatment for diabetic emergencies to the satisfaction of the instructor by answering the review questions to 100% accuracy.

Procedure:

1. Reread the objective.
2. Study the information sheet.
3. Answer the review questions.
4. Direct any questions, about the material, to the instructor.

Review Questions:

1. Briefly explain diabetes.

2. What is an insulin reaction and how does the rescuer treat this condition?

3. Where are medical alert tags found on a victim?

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RESEARCH MSK
INSTRUCTOR
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PREPARED BY: Mr. James DeHaven

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PROGRAM D-2 UNIT NO. 03 MODULE NO. 05 TASK NO. 120

INFORMATION SHEET

To better understand the types of diabetic emergencies that may occur, a brief knowledge of diabetes is necessary.

The human body removes glucose (sugar) from the food we eat and stores that sugar until the body needs it. A chemical called insulin is produced by the pancreas and helps the storage and use of sugar in the body. A diabetic is a person, whose pancreas does not produce enough insulin and the sugar level in the bloodstream raises to dangerous levels If properly recognized and treated, the diabetic can control his own sugar level by taking injections or pills of insulin to maintain that sugar level, and no real danger exists. There are millions of people in the world who have diabetes, and if properly controlled, they may lead a normal life.

There are only two major diabetic emergencies. The first is caused by too much insulin and is called an insulin reaction. This reaction seems to happen very quickly and can be caused by too much work or exercise, not eating enough food or by taking too much insulin. An insulin reaction is recognized by extreme hunger, rapid pulse, extreme sleepiness, excessive sweating, headache or by impaired vision and speech. To treat this diabetic emergency simply give the diabetic some food that contains sugar, (a stick of gum or hard candy will do) and call a doctor for further instructions.

The other diabetic emergency is called a diabetic coma and happens much slower than the insulin reaction. The diabetic coma is the opposite of an insulin reaction and may be caused by eating too much food, taking too little insulin, infection, fever or emotional stess. A diabetic coma can be recognized by stomach pains, loss of appetite and exteme thirst. To treat a diabetic coma the rescuer should keep the victim warm and dry and immediately call a doctor for further instructions.

In most cases, the diabetic himself will be able to treat the emergency. If the diabetic is aware of diabetes and its complications, (once the doctor has discovered diabetes, the diabetic is trained in controlling reactions) he may be able to help other workers in this emergency by explaining 1) what he needs and 2) what must be done to assist him.

If any victim is unconcious for no apparent reason, check the victim for a medical alert tag. This tag can either be worn as a neckchain or bracelet, and gives the victims name, illness and emergency procedure. The tag will also contain the phone number of his personal physician or the nearest medical center.

PROGRAM D-2 UNIT NO. 03 MODULE NO. 05 TASK NO. 120

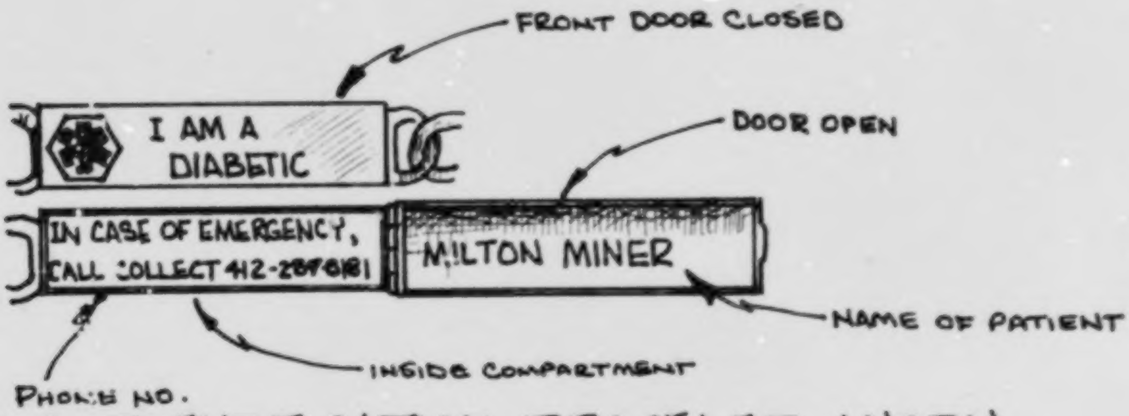
FRONT DOOR CLOSED
I AM A DIABETIC
DOOR OPEN
IN CASE OF EMERGENCY, CALL COLLECT 412-2876181
MILTON MINER
NAME OF PATIENT
INSIDE COMPARTMENT
PHONE NO.

FIG. 1 IDENTIFICATION BRACELET WORN BY A DIABETIC

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PROGRAM D-2

STUDENT NAME

UNIT 03 MODULE 05 TASK 130

INSTRUCTOR

DATE COMPLETED

INSTRUCTOR'S INITIALS

TASK TITLE: *First Aid Treatment for Epileptic Emergencies.*

Objective:

After studying the material, the student will explain the first aid treatment for Epileptic emergencies to the satisfaction of the instructor by answering the review questions to 100% accuracy.

Procedure:

1. Reread the objective.
2. Study the information sheet.
3. Direct any questions, about the material, to the instructor.
4. Answer the Review Questions.

Review Questions:

1. What is epilepsy?
2. What is the first sign of a coming seizure?
3. Why move objects away from a seizure victim?
4. If breathing stops during a seizure, why can't the rescuer use mouth to mouth resuscitation?
5. Why should the victim's head be turned to one side, during a seizure?

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REVIEWED & APPROVED

RESEARCH MSK

INSTRUCTOR

ADMINISTRATION

PREPARED BY: Mr. James DeHaven

PROGRAM D-2 UNIT NO. 03 MODULE NO. 05 TASK NO. 130

INFORMATION SHEET

Epilepsy is a disorder of the nervous system which causes the epileptic to occasionally develop a seizure. These seizures often include a loss of conciousness and convulsions (the victim's body will shake violently).

Much has been learned about epilepsy in the past few years. Through medication and a proper diet, the epileptic can control his seizures.

However, several conditions may cause seizures (even though epilepsy is the most common cause). When "having" a seizure the victim will become unconcious and quickly collapse. The victim's body will begin to shake violently and there may be severe muscle spasms of the jaw. The victim may vomit and breathing is very difficult. These seizures last only a few minutes but may be followed quickly by another seizure. After a seizure, the victim may fall into a deep sleep for several hours and will awaken with no knowledge of what has occurred.

To treat the victim of a seizure:

1) Be aware. An epileptic may know when a seizure is coming. Before a seizure begins he will become pale and weak. He may give simple instructions before he begins a seizure. Do exactly as he asks.
2) Do not permit the victim to injure himself while having convulsions. Move all objects away, but do not try to restrain the victim.
3) Turn the victims head to the side and hold his lips open, if possible. These steps will allow air and vomit to escape and will assist breathing. Do not attempt to force anything between the victim's teeth.
4) When the victim has stopped shaking, loosen the clothing around the neck, keep his head to the side and permit him to sleep.
5) If the victim's seizure does not end in a few minutes, or repeats itself, call a doctor for instructions immediately.

The victim may stop breathing during a seizure. To restart the breathing process perform mouth to nose resuscitation. (Since it will be unlikely the victim's mouth can be opened for mouth to mouth.) Keep the victims lips pinched shut during ventilation, but open them after each breath to let the air escape.

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PROGRAM D-2
STUDENT NAME
UNIT 03 MODULE 05 TASK 140
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *First Aid Treatment For Heat Exhaustion.*

Objective:
After studying the information sheet, the student will explain the causes, symptoms and treatment for heat exhaustion by answering all review questions correctly.

Procedure:
1. Read the objective at least twice.
2. Study the information sheet.
3. Answer all review questions.

Review Questions:
1. Define heat exhaustion.
2. What causes heat exhaustion?
3. What are the symptoms of heat exhaustion?
4. How should heat exhaustion be treated?

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RESEARCH
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PREPARED BY: Mr. James DeHaven

INFORMATION SHEET

Heat exhaustion is a state of collapse from heat and may be associated with heat cramps. It comes from the pooling of blood in the vessels of the skin. The blood transports heat from the interior of the body to the surface and causes the skin vessels to dilate and pool a large amount of blood in the skin. This, along with the blood pooled in the lower extremities when in an upright position, may lead to an inadequate return of blood to the heart and a physical collapse. Heat exhaustion occurs most often in high humidity.

Although the victim is usually conscious, his pulse is rapid and weak and his breathing is rapid and usually shallow. His face is pale, anxious - looking and covered with cold, clammy perspiration. He may be dizzy and chilly, and give the appearance of having fainted.

Basically the victim is in a state of mild shock and should be treated as such. Remove the victim to a cool place, make him comfortable and remove as much clothing as possible. Allow the victim to rest. If prompt recovery is not seen after rest in a cool area immediately seek medical care. A physician may direct an intravenous infusion of fluid.

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PROGRAM D-2
UNIT 03 MODULE 05 TASK 150
DATE COMPLETED ________
STUDENT NAME ________
INSTRUCTOR ________
INSTRUCTOR'S INITIALS ________

TASK TITLE: *First Aid Treatment for Heat Cramps.*

Objective:

After studying the information sheet, the student will explain the causes, symptoms and preventions for heat cramps by correctly answering all the review questions.

Procedure:

1. Read the objective several times.
2. Study the information sheet.
3. Answer all review questions.

Review Questions:

1. Define heat cramps.
2. What causes heat cramps?
3. Why is salt water a good treatment for heat cramps?
4. What are the three symptoms of heat cramps?
5. Briefly explain how to treat for heat cramps.
6. What precautions can be taken to prevent heat cramps?

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REVIEWED & APPROVED RESEARCH ________ INSTRUCTOR ________ ADMINISTRATION ________

PREPARED BY: Mr. James DeHaven

PROGRAM D-2 UNIT NO. 03 MODULE NO. 05 TASK NO. 150

INFORMATION SHEET

Heat cramps are painful muscle spasms, usually in leg and abdominal muscles, resulting from stenuous labor (not always in high temperatures) or drinking iced drinks too quickly or too much. Due to the profuse sweating, the loss of salt from the body causes painful cramps, some severe enough to cause convulsions. Attacks may be brief or may last 12 to 24 hours. Even after they are relieved, the spasms may be renewed by exposure to a cold draft or exertion.

Symptoms of heat cramps are pain from muscle cramps in legs and abdomen, fainting and profuse perspiration.

To treat heat cramps, remove the victim to a cool place and give him slips of salted drinking water (one teaspoon of salt to one quart of water). Apply manual pressure to the muscles that are cramped. Mild heat cramps can be soothed by warm baths and rest, but severe and persistent cramps should have medical care.

Prevention of heat cramps is very important. Men laboring in high temperatures should drink alot of cool water (10 to 15 glasses a day) to replace lost fluids due to sweating. They should eat plenty of salt, limit their diet to light, easily digested food, avoid fatty food and avoid constipation. Working clothes should be light.

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EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2 STUDENT NAME

UNIT 03 MODULE 05 TASK 160 INSTRUCTOR

DATE COMPLETED INSTRUCTOR'S INITIALS

TASK TITLE: *First Aid Treatment for Heat Stroke.*

Objective:
After studying the information sheet, the student will explain the causes and symptoms for heat stroke by correctly answering all the review questions and demonstrate the treatment to meet the instructor's approval.

Procedure:
1. Read the objective several times.
2. Study the information sheet.
3. Demonstrate the treatment for heat stroke on a dummy to meet instructors approval.
4. Answer all review questions.

Review Questions:
1. Define heat stroke.
2. What causes heat stroke?
3. Briefly describe the symptoms for heat stroke.
4. Briefly describe the treatment for heat stroke.

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REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. James DeHaven

INFORMATION SHEET

Heat stroke is a sudden attack of illness from prolonged exposure to high temperatures. Those laboring hard in confined quarters with poor air circulation or in direct sun exposure are very likely to be affected. Heat stroke may result in convulsions, unconsciousness and death. (Heat stroke has a twenty percent mortality rate.)

The attack is sudden. The victim becomes unconscious rapidly, preceded by intense headache and dizziness. The skin becomes dry, hot and flushed with no perspiration. The pulse is full, strong and rapid. Breathing is deep at first, later shallow and almost absent and of a snoring type. The muscles twitch and grow into convulsions. The body temperature may reach 105 or higher, blood pressure falls and a coma or near coma may exist,

To treat, the high body temperatures must be reduced as soon as possible. Remove the victim to a cool place and lay him down. Remove as much clothing as possible. Place a pad under the shoulders and head to reduce the flow of blood to the brain. Make sure there is an open airway. Immediately reduce the body temperature by applying cold applications to the body and head or preferably by wrapping in a wet sheet. If available, place cold packs under the arms, around the neck, at the ankles or any place where blood vessels are close to the skin and can be cooled. Place an ice bag on the head. Rub the body with the cold packs, especially rubbing the limbs toward the heart to aid circulation. Continue until consciousness returns or until the body temperature reaches normal. Watch for signs of shock. Give the conscious victim drinks of cool water but do not give stimulants. If the skin turns hot and dry again, reapply cold applications. Medical care should be obtained as soon as possible.

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PROGRAM D-2
STUDENT NAME
UNIT 03 MODULE 05 TASK 170
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TASK TITLE: *First Aid Treatment for Exposure.*

Objective:

After studying the information sheet, the student will define general cooling, and briefly explain the process, symptoms and treatment for general cooling by correctly answering all the review questions.

Introduction:

The effects of cold may be categorized as either general, cooling of the entire body, and local, cooling of parts of the body (frostbite).

Procedure:

1. Read the objective at least twice.
2. Read and reread the introduction.
3. Study the information sheet.
4. Answer all review questions.

Review Questions:

1. What is meant by general cooling?

2. Briefly explain the stages the body undergoes as the result of general cooling.

3. Briefly describe the treatment for general cooling.

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PREPARED BY: Mr. James DeHaven

PROGRAM D-2 UNIT NO. 03 MODULE NO. 05 TASK NO. 170

INFORMATION SHEET

General Cooling

General cooling of the entire body occurs when it is exposed to low temperatures for extended periods. Those who suffer from general cooling become ill, even if they are well protected by clothing, because the cold affects the system slowly and trickily. Factors, such as fatique, hunger and the physical condition, quicken the effects of prolonged exposure to cold.

The body goes through several stages when cooling. First, it shivers, attempting to generate heat and maintain a normal body temperature. As it cools, there is a feeling of unconcern and indifference. Cooling becomes more rapid, the victim becomes sleepy and unconsciousness follows. The eyes will appear glassy as the respiration and pulse rate continues to slow until finally the extremities freeze and death results.

Medical help is of utmost importance. A victim exposed to general cooling should be transported to a medical facility without delay. Until then, replace wet clothing with dry. Make sure all body surfaces are warmed since the victim's body cannot generate heat. Use hot water bottles, heating pads, etc. but do not place artificial heat next to the bare skin. If a warm place inside is available and the victim is conscious, a hot bath and hot liquids are recommended.

Carefully check heartbeat and respiration in case resuscitation is required.

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PROGRAM D-2 STUDENT NAME ______

UNIT 03 MODULE 05 TASK 180 INSTRUCTOR ______

DATE COMPLETED ______ INSTRUCTOR'S INITIALS ______

TASK TITLE: *First Aid Treatment for Frostbite.*

Objective:

After studying the information sheet, the student will demonstrate and explain the first aid treatment for frostbite to meet the instructors approval and answer all the review questions correctly.

Introduction:

Due to the cold conditions and air currents, frostbite is very common in underground mines, especially around the main haulageways. Some persons are more prone to frostbite than others, such as those who are nervous, easily excited and sweat profusely. It is important to be on the alert for signs of frostbite so all steps can be taken to protect the affected part as soon as possible.

Procedure:

1. Read the objective several times.
2. Read the introduction several times.
3. Study the information sheet.
4. Practice the treatment procedure on a dummy or partner to meet the instructors approval.
5. Answer all review questions.

Review Questions:

1. Define frostbite.

2. What are the symptoms of frostbite?

3. Briefly explain how to treat frostbite on-the-scene.

4. Briefly explain how to treat frostbite once indoors.

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REVIEWED & APPROVED RESEARCH ______ INSTRUCTOR ______ ADMINISTRATION ______

PREPARED BY: Mr. Alton Hewitt & Mr. James DeHaven

INFORMATION SHEET

Frostbite is the result of over exposure to severe cold. Because of the constriction of the blood vessels, the blood supply to a particular body part becomes so limited, that the tissues do not contain enough warmth to prevent freezing. The parts most commonly affected are the ears, nose, hands, feet and cheeks. In severe cases, gangrene may set in resulting in the loss of that part.

Usually pain is not present with frostbite but an intense coldness or numbness is. The symptoms are progressive and often the victim is not aware of frostbite until it is too late. The exposed skin becomes red and as exposure continues, the skin turns to gray or white blotches, especially at the ear lobes, cheeks and tip of the nose. Because of the reduced circulation, the skin surface becomes numb. If freezing continues, all sensation is lost and the frostbitten area becomes dead white.

To treat frostbite, do not rub the part. The part should not be exposed to high temperatures immediately. Until the victim can be taken indoors, the frozen part should be covered with woolen cloth and the victim made warm with extra blankets, if possible. He should be brought into a warm room and given a warm drink, preferably coffee since it stimulates and helps to dilate the blood vessels, as soon as possible. If blankets are not available, the affected part should be warmed under the arms or between the legs of the victim since these parts are almost always at normal body temperature.

The affected part must be handled carefully to avoid further injury. If it is still cold and numb, gradually rewarm the affected part by immersing it in lukewarm water, making sure it does not touch the container. Excessive heat may cause severe damage. Carefully and thoroughly dry the warmed area to avoid recooling by evaporation.

Once thawing is complete, exercise the injured part by raising and lowering it rhythmically to stimulate the return of circulation. Avoid pressure on any part of the affected area. Do not disturb blisters. Cover the part with a dry, sterile dressing. Do not allow the victim to smoke, as the tobacco further constricts the blood vessels and restricts circulation. Second and third degree frostbites should have medical care as soon as possible.

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PROGRAM D-2 STUDENT NAME

UNIT 03 MODULE 05 TASK 190 INSTRUCTOR

DATE COMPLETED INSTRUCTOR'S INITIALS

TASK TITLE: *First Aid Treatment For Ingested And Inhaled Poisons.*

Objective:

After studying the information sheet, the student will explain the symptoms and treatments for ingested and inhaled poisons by correctly answering all review questions.

Procedure:

1. Read the objective at least twice.
2. Study the information sheet.
3. Answer all review questions.

Review Questions:

1. What is the most effective treatment for most poisoning?

2. What cases should vomiting NOT be induced?

3. Briefly list three methods for inducting vomiting.

4. Briefly describe the symptoms of ingested poisoning.

5. Briefly describe the symptoms of inhaled poisoning.

6. Briefly explain the treatment for a victim suffering from inhaled poisoning.

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REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. James DeHaven

7. What is the only reliable sign of carbon monoxide poisoning?

8. Briefly explain how to treat carbon monoxide poisoning.

INFORMATION SHEET

Symptoms of poisoning differ according to the nature of the poison and the method in which it enters the body. If the container which held the poison is available, check the label for a listing of dilutants which are especially affective for that type of poison. Often with poisons, noticeable symptoms may not show for hours.

Ingested Poisons

Symptoms of ingested poisoning (those taken in by mouth) are of the gastrointestinal type, such as nausea, vomiting, diarrehea, cramps and severe abdominal pain. The victim may also have slow respiration and circulation.

Like food, poisons stay in the stomach a short time before passing into the intestine, where they are absorbed into the system. Fast removal of ingested poisons before they leave the stomach is of the utmost importance. Usually vomiting is the answer, but there certain cases in which vomitting causes further damage. The following are such cases in which vomiting should NOT be induced:

1. If the victim has swallowed a strong acid or alkali. Vomiting would cause damage to the throat and esophagus.
2. If the victim has swallowed a petroleum product. Vomiting might cause a serious form of pneumonia if aspirated into the lungs.
3. If the victim is unconscious and aspirates vomitus into the lungs.
4. If he has convulsed vomiting may continue or resume.
5. If he has a serious heart condition which the strain of vomiting will aggravate.

In cases which call for induced vomiting, use one of the following methods:

1. Syrup of Ipecac in the dose of one tablespoon followed by several glasses of warm water. If within 15 minutes the victim does not vomit, repeat the dose.
2. Large amounts of stomach-irritating fluids, such as warm water and table salt or mustard, are quite effective.
3. Tickling the back of the throat with a finger or blunt object. First dilute the poison with large amounts of fluid. Remember to keep the victim's head as low as possible to avoid aspiration of vomitus into the lungs. Collect the vomitus so that it and the poison container, can be examined at the hospital.

Inhaled Poisons

Symptoms of inhaled poisoning (those taken in by breathing) are of the respiratory type, such as shortness of breath, coughing and cyanosis. If these problems are not corrected, the victim may pass into cardiac arrest.

Remove the victim from the poisonous atmosphere into fresh air. If he is breathing, flush his lungs with oxygen. If he is not breathing, apply cardiopulmonary resuscitation.

One of the most common inhaled poison is carbon monoxide. Besides being odorless, tasteless and colorless (thus giving no warning), carbon monoxide is especially dangerous because it unites with the red blood cells faster than the oxygen, causing a lack of oxygen and death.

The only sign of carbon monoxide poisoning that is reliable and unmistakeable is the cherry-red coloring of the skin.

To treat carbon monoxide poisoning, remove the victim to fresh air and begin oxygen inhalation at once, preferably with a bag-mask resuscitor. A mechanical inhalator may be used if the victim is breathing spontaneously. The victim should be transported to the hospital as soon as possible.

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STUDENT NAME ______
UNIT 03 MODULE 05 TASK 200
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TASK TITLE: *First Aid Treatment For Poisonous Snake Bites.*

Objective:

After studying the information sheet, the student will explain the symptons and first aid treatment for poisonous snake bites to the approval of the instructor and answer the review questions to 100% accuracy.

Introduction:

The four types of poisonous snakes in the United States are rattlesnakes, copperheads, moccasins and coral snakes. The first three types are termed pit vipers because of the small, deep pits between the nostils and eyes which can inject verom into their victims through long fangs in the front part of the upper jab.

Identifying features: (all have slit-like pupils and triangular-shaped heads)
Rattlesnakes - rattles
Cottonmouth moccasin - mouth has white interior
Coral - smaller than pit vipers, red, black and yellow bands.

Procedure:

1. Read the objective several times.
2. Read the introduction several times.
3. Study the information sheet.
4. Answer all review questions.

Review Questions:

1. Briefly describe the symptoms of a poisonous snake bite.

2. Briefly describe the procedure to use to treat snake bite victims.

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PREPARED BY: Mr. Alton Hewitt

INFORMATION SHEET

Snakebite is seldom fatal, although crippling of the hands and feet or loss of a limb may result. The degree of seriousness depends on the amount of vernom injected, the size of the victim and the first aid administered.

The first symptom of a poisonous snake bite is a stinging pain where one or two puncture marks are. Swelling and discoloration is rapid. Nausea, vomiting and respiratory distress results. As the poison enters the body through the veins, great weakness, nausea, weak and rapid pulse and a profuse flow of saliva results. The victim may go into shock. Muscular paralysis develops after several hours and the victim will pass into a stupor.

First aid should accomplish two things:

1. Restrict the spread of venom and;
2. Slow its action on muscle tissues.

Treatment should be started immediately to minimize the spread of poison throughout the system. Keep the victim still. Since exercise stimulates circulation and increased circulation causes the poison to spread faster, do not allow the victim to move about. Remove rings, bracelets and watches.

As soon as possible;
Apply a light tourniquet both above and below the bite area and pack the area in ice. The bite area should be kept in a horizontal position, since gravity will cause the venom to spread. Do not restrict the flow of blood with a too tight tourniquet. Avoid touching the bite area with water from the ice. Use ice or chemical cold packs to pack the area. Freon oe ethyl chloride sprays may freeze the skin and cause frostbite. Cold beer cans have been known to do the trick when ice was not available.

Since time is a greater enemy than exercise, it is urgent to get to medical aid any way possible. Do not wait for an ambulance, but take the most convenient means of transportation. If possible, take the dead snake to the hospital so the amount and depth of venom injected can be determined.

Crosscuts and suction are being discarded because of the possibility of infection, profuse bleeding and serious complications when no first aid was necessary.

Remember these simple steps:

1. Apply a light tourniquet above and below the snakebite.
2. Pack the biten area with ice.
3. Seek medical aid as quickly and safely as possible.
4. If possible, bring the dead snake with you.

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PROGRAM D-2
STUDENT NAME
UNIT 03 MODULE 05 TASK 210
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TASK TITLE: *First Aid Treatment for Insect Bites and Stings.*

Objective:

After studying the information sheet, the student will explain the symptoms and treatment for bites and stings of insects by correctly answering all review questions.

Procedure:

1. Read the objective several times.
2. Study the information sheet.
3. Answer all review questions.

Review Questions:

1. List some general symptoms of stings and bites.

2. Briefly describe how to remove a stinger from a wound.

3. Briefly describe how to treat an allergic victim who is stung or biten.

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REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. James DeHaven

PROGRAM D-2 UNIT NO. 03 MODULE NO. 05 TASK NO. 210

INFORMATION SHEET

Most insects bite or sting, but few leave serious or dangerous damage. Some do, however, carry diseases. If an insect has been feeding on or in contact with poisonous substances, it's bite or sting may inject poison or infect a wound.

Those who have serious reactions from previous insect bites are urged to seek medical care for immunization.

Usually the symptoms of strings and bites leave only local irritation and pain in that area often accompanied by moderate swelling, redness, itching and burning.

If a stinger is left in the wound, remove it. Apply a weak ammonia solution (aromatic spirts of ammonia). A paste made of baking soda and water can also be used. Moisten a compress with cold ammonia water and apply it to the wound. For bee and wasp stings, immediately apply ice or cold water to relieve the pain and slow the absorption of venom from the stung area.

If the victim is allergic to bee, wasp or other insect poison, use a tight constricting bandage to localize the venom and apply ice until medical care can be obtained.

In any case, medical care should be obtained if swelling, pain, itching and burning persists.

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STUDENT NAME

UNIT 03 MODULE 06 TASK 010

INSTRUCTOR

DATE COMPLETED

INSTRUCTOR'S INITIALS

TASK TITLE: *How to transport an accident victim.*

Objective:

After studying the material, the student will demonstrate all the methods of transporting an injured worker and explain which method should be used for particular injuries to the satisfaction of the instructor. The student will also answer all review questions accurately.

Introduction:

Transporting an accident victim from inside the mine to an ambulance outside the mine entrance is very difficult. Many sections of roof are extremely low and the distance to travel may be long. Transporting a victim must be done quickly and effectively to get proper medical attention in the shortest time.

Materials:

A spinal board or splint frame stretcher.

Procedure:

1. Reread the objective.
2. Study the information sheet.
3. Demonstrate and explain all methods.
4. Answer the review questions.

Review Questions:

1. What must be considered before moving an accident victim?

2. Which method of transportation may be used when the roof is low?

3. Name three objects that the rescuer will have with him that may be used to tie the victim's hands together before using the fireman's drag?

4. When is the saddle-back carry useful?

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PREPARED BY: Mr. Alton Hewitt

5. Before using the clothes drag, why should the collar be opened?

6. Name two other types of underground equipment that may be found at the face and used to transport the victim.

7. What types of track equipment may be used to transport an accident victim?

INFORMATION SHEET

When selecting a method of transporting an accident victim, the worker should consider the following conditions:

1. Is there an immediate danger to the victim? (Fire, explosion, gases, etc.)

2. What injuries has the victim suffered?

3. Is there a neck or back injury?

4. Have all major injuries been treated?

5. How far must the victim be transported and how high is the roof along the trip?

Each of these conditions will help the worker decide how to transport his victim and how soon to transport.

There are many methods of transporting an accident victim. However, this section will only deal with the methods which could apply to mine conditions and the accidents which may occur.

The Clothes Drag (Fig. #1)

The clothes drag is generally used when the victim must be moved quickly through a low section of the mine. To use the clothes drag, lay the victim face up and grab the collar of his shirt or coat in back of his head. Let his head rest on your forearm and keep his body as straight as possible. Since the worker must keep low to prevent bending the victim's neck, this method is useful when dealing with a low mine section.

When dragging the victim, make sure that the collar is not pulled tightly around his neck and causing breathing difficulty. (Unfasten the top two buttons or lower the zipper.) If the area is rugged, the worker may put both arms under the victim, supporting the head with both forearms and continue dragging.

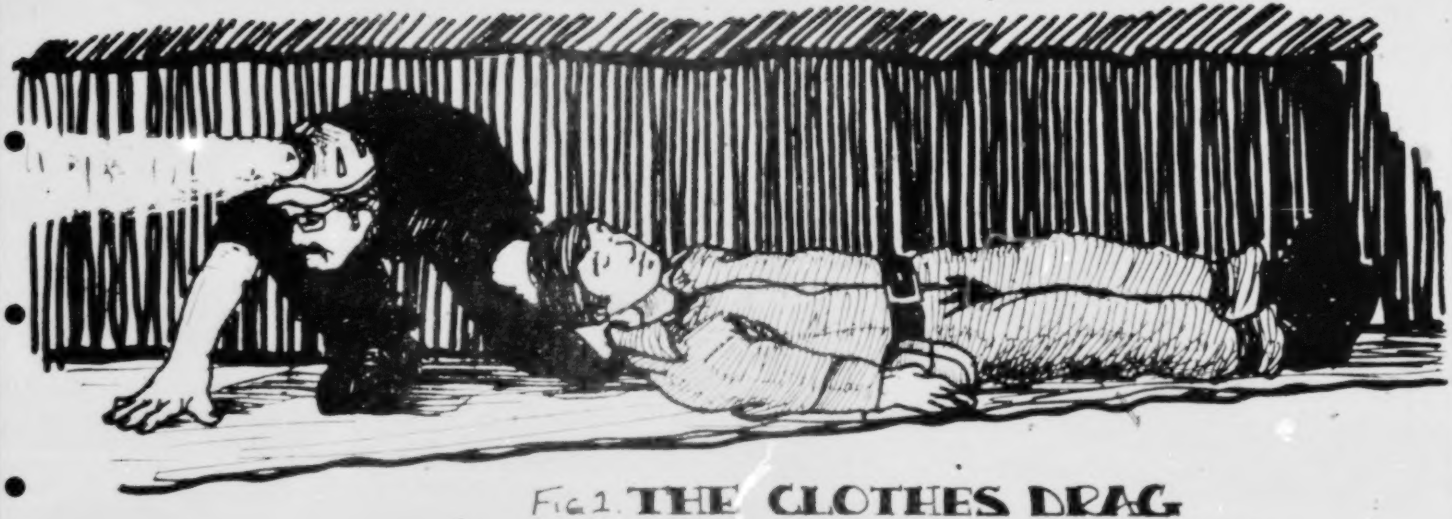

Fig.1. THE CLOTHES DRAG

The Fireman's Drag (Figure #2)
When a victim is moved by the fireman's drag, his wrists must be tied together with a piece of rope, cloth or some other material. The worker should lay the victim face up and straddle his body. The victim's hands will be looped over the workers head. The worker should raise his upper body until the victim's shoulders are slightly off the ground. The worker may now crawl with his victim. (Be careful that the victim is not unnecessarily hurt by rugged floor.)

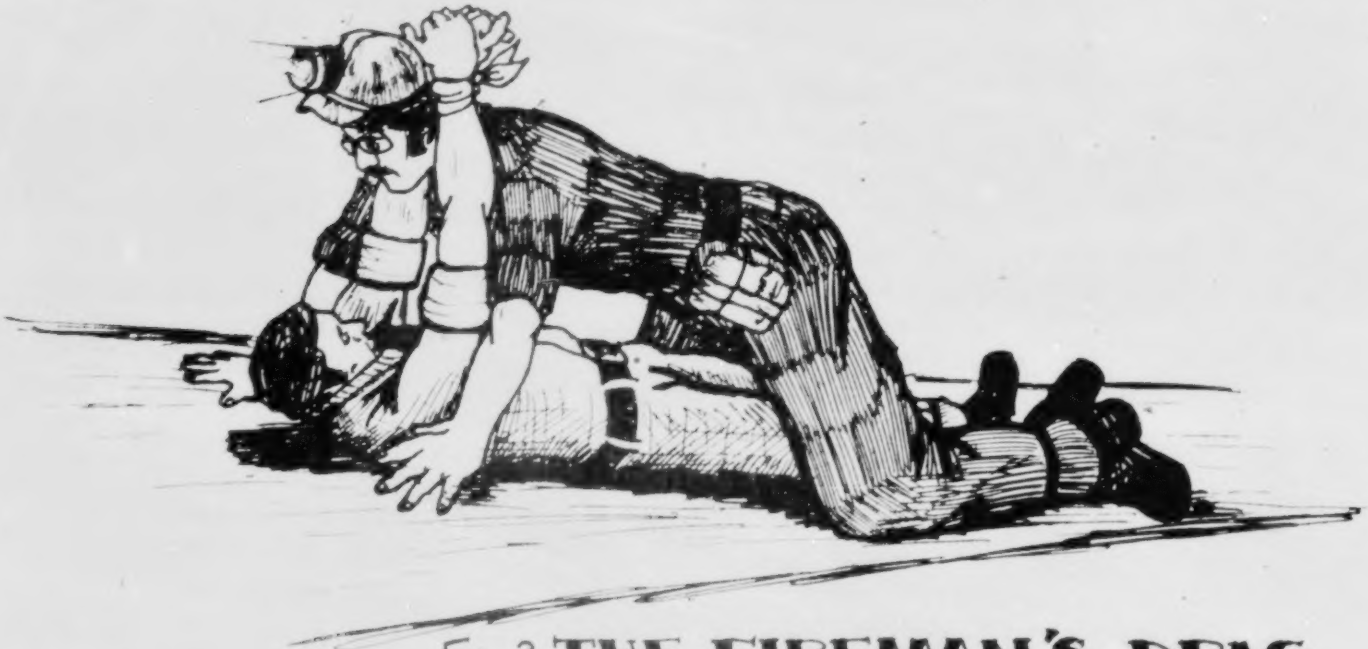

Fig.2 THE FIREMAN'S DRAG

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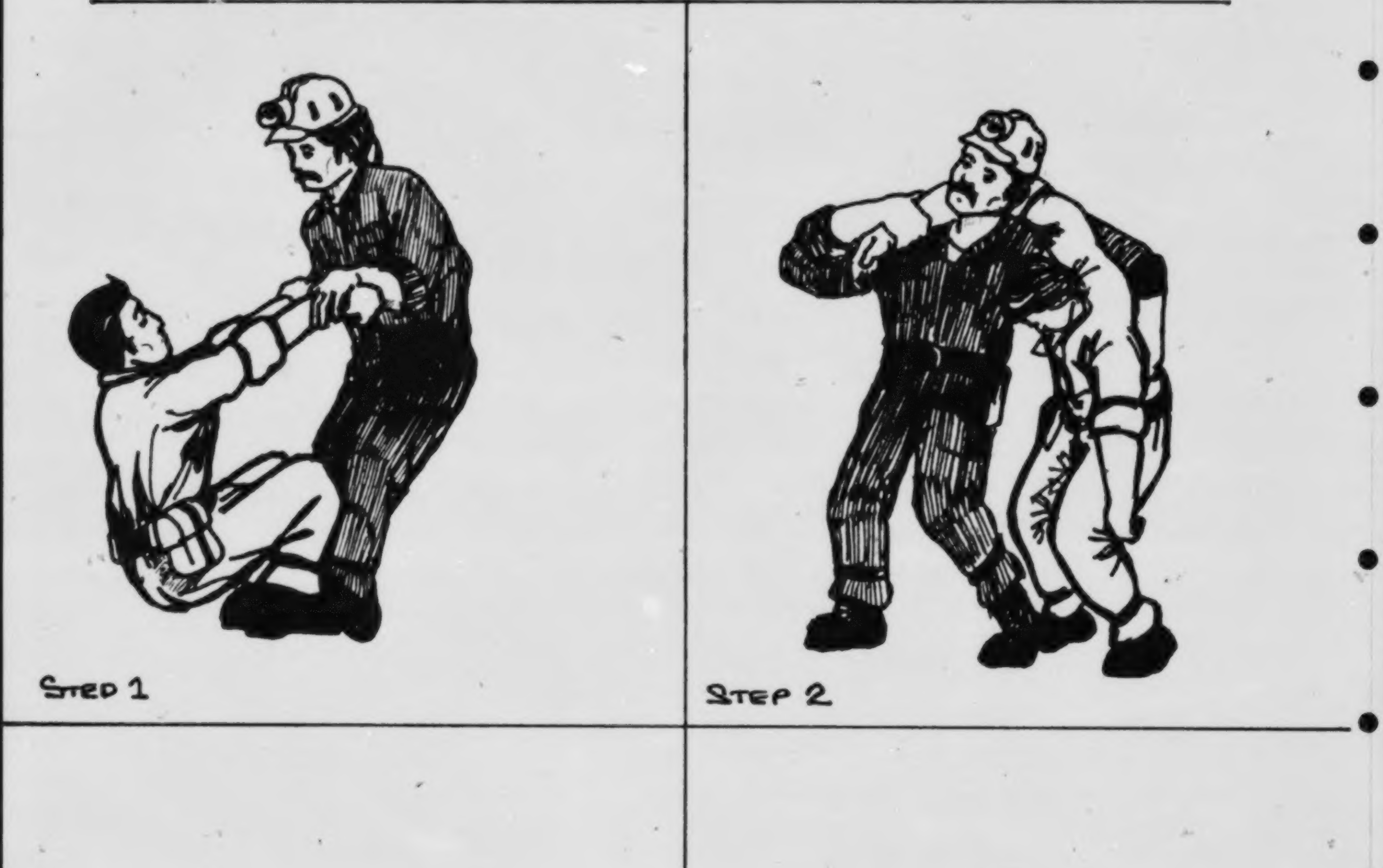
Fig.3 THE SADDLEBACK CARRY



Step 1

Step 2

Step 3

Step 4

The saddle-back carry (Fig. No. 3)
In this method, the victim is carried on the workers lower back, just over the hips, using this method, the worker can carry a victim for longer distances without tiring. However, since the worker must be standing upright when using this carry, it can only be used in sections of high roof.

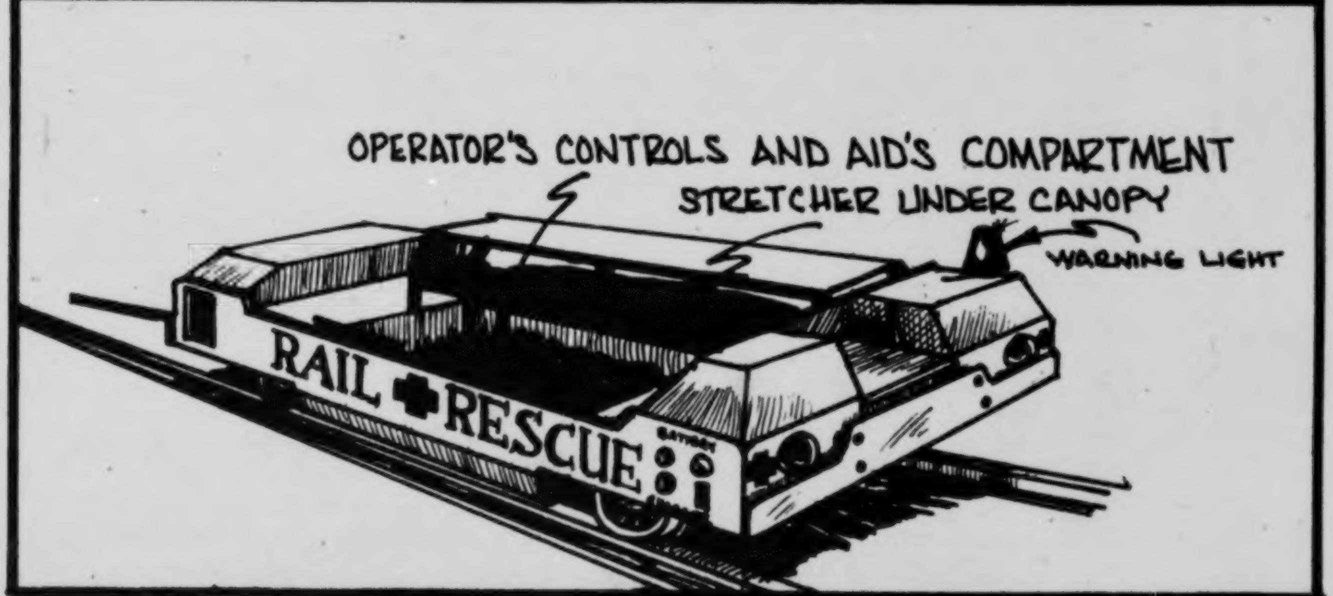
To perform the saddle-back carry, the rescuer must lift the victim as illustrated in Step #1. Supporting the victim beneath the armpit with one arm, the rescuer should simply raise the victim, facing the same direction as the rescuer, and place the victims arm over his shoulder. (Step #2) While keeping a firm hold on the victim, the rescuers should simply step in front of the victim, stoop and grab both legs behind the knees. (Step #3) The rescuer may now stand and walk, simply by leaning forward to balance himself with the added weight of the victim. (Step #4)

Stretchers, Litters and baskets
All the methods of transporting an accident victim mentioned so far (the clothes drag, the fireman's drag and the saddle-back carry), should only be used when the victim must be moved immediately to avoid further injury. (Mine gas, fire, explosion, roof fall, etc.)

Since federal law 75.1713-7 requires that a stretcher must be located in each working section, the worker should have a knowledge of its location and its uses. Obviously, a stretcher, litter or basket would be easier for the rescuer to use when transporting a victim and much easier on the victim's injuries, then any methods previously mentioned.

A variety of stretchers are available for mine use. The workers should try to use these stretchers properly during an accident and avoid injuring the victim.

FIG.4 FIRST AID CAR FOR USE UNDERGROUND.



In most mines, the distance to transport an accident victim is very great. There are many different methods of transporting victims from mine sections to the outside but each method has its advantages and dangers.

Conveyor belts

The most common method of transporting an accident victim is by conveyor belt. Belts are often used to transport workers to and from mine sections. Since conveyor belts generally extend from a section near the face (where most accidents occur) to the outside of the mine, a belt is often the quickest and easiest method to transport accident victims. Victims must travel belts with a rescuer. The belt must be adjusted to a slower speed when transporting men. Both the rescuer and victim should lay flat on the belt with the rescuer on the same side as the stop line.

Tram Equipment

If conveyor belts and track equipment are distant from the accident, tram vehicles may be used for transporting accident victims. Shuttle cars are useful in victim transportation since the victim may lay flat in the bed of the shuttle car.

Track Equipment

Track equipment may be used in transporting accident victims. However, special care must be taken to prevent the victim from falling off the vehicle or touching any live electrical wires. Track Equipment is probably the quickest method of transporting a victim to the outside and is therefore very useful.

Many mines are now equipped with specially designed battery powered first aid "cars" for use in underground emergencies. These cars are equipped with a stretcher, first aid kit and other emergency supplies. (See Fig. #4)

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PROGRAM D-2
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UNIT 04 MODULE 01 TASK 010
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TASK TITLE: *Entry Roof Support.*

Objective:

After studying the material, the student will understand the reasons and methods of roof support to the satisfaction of the instructor by answering the review questions to 80% accuracy.

Procedure:

1. Read the objective.
2. Study the information sheet.
3. Answer the review questions.

Review Questions:

1. Why is roof support necessary?
2. What is the greatest hazard in the mine? Why?
3. Why is a slate or soapstone roof dangerous?
4. What are the three basic types of permanent roof support?
5. What is the principle material used in conventional roof support?

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PREPARED BY: Mr. Wayne Farabaugh

PROGRAM D-2 UNIT NO. 04 MODULE NO. 01 TASK NO. 010

INFORMATION SHEET

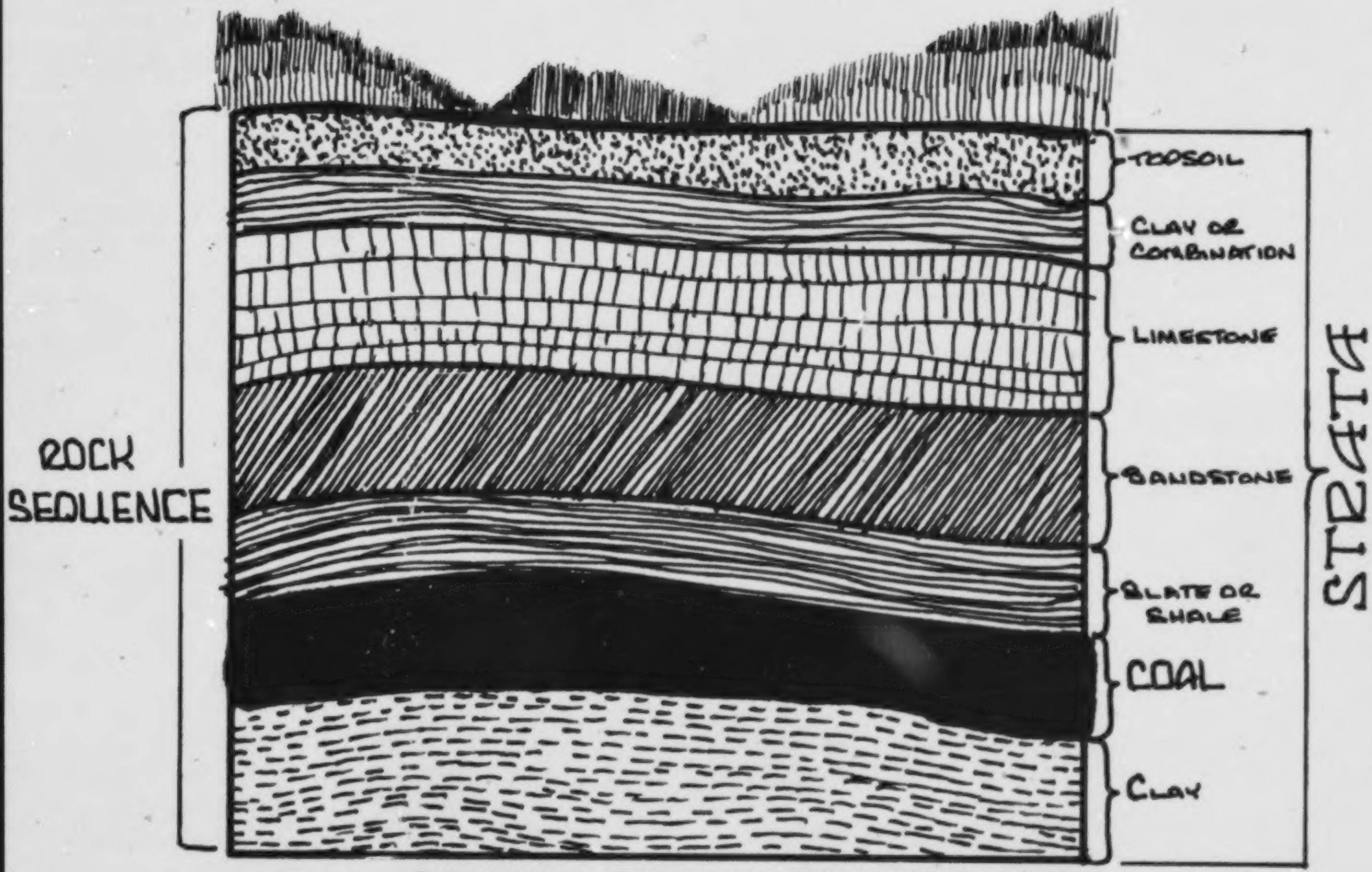

FIG.1 CROSS SECTION OF THE EARTH

The weight of the rock on all sides of a mine entry or room exerts tremendous pressure on the entry. This pressure has helped form the vein of coal in the first place. However, once the coal has been removed, there is nothing to support the weight and pressure. If artificial support is not constructed to replace the lost coal, the entry will collapse or "cave-in". Accidents involving a roof fall or "cave-in" are the major cause of injury or death in the coal mines. For this reason, proper roof support is important.

To better understand the methods of roof support, the worker should be aware of what type of rock must be supported and how that rock may fall. In most cases, the only rock that must be supported is the natural arch formed in the immediate roof. The coal pillars on either side of the entry will support the main roof or overburden. (See fig. #2)

When the coal has been removed, the immediate roof may sag from the pressure of its own weight and the weight of the overburden. The immediate roof is often slate (shale). If this layer is exposed to the air for a short time, it will dry out and begin to flake. Other forms of rock (soapstone) may have the same effect. These types of roof are the most hazardous and require the best support.

In addition to the possibility of a roof fall most mines may also experience a "heaving" bottom (the bottom may raise) or a moving rib. Roof support structures should be designed to protect the worker from these dangers.

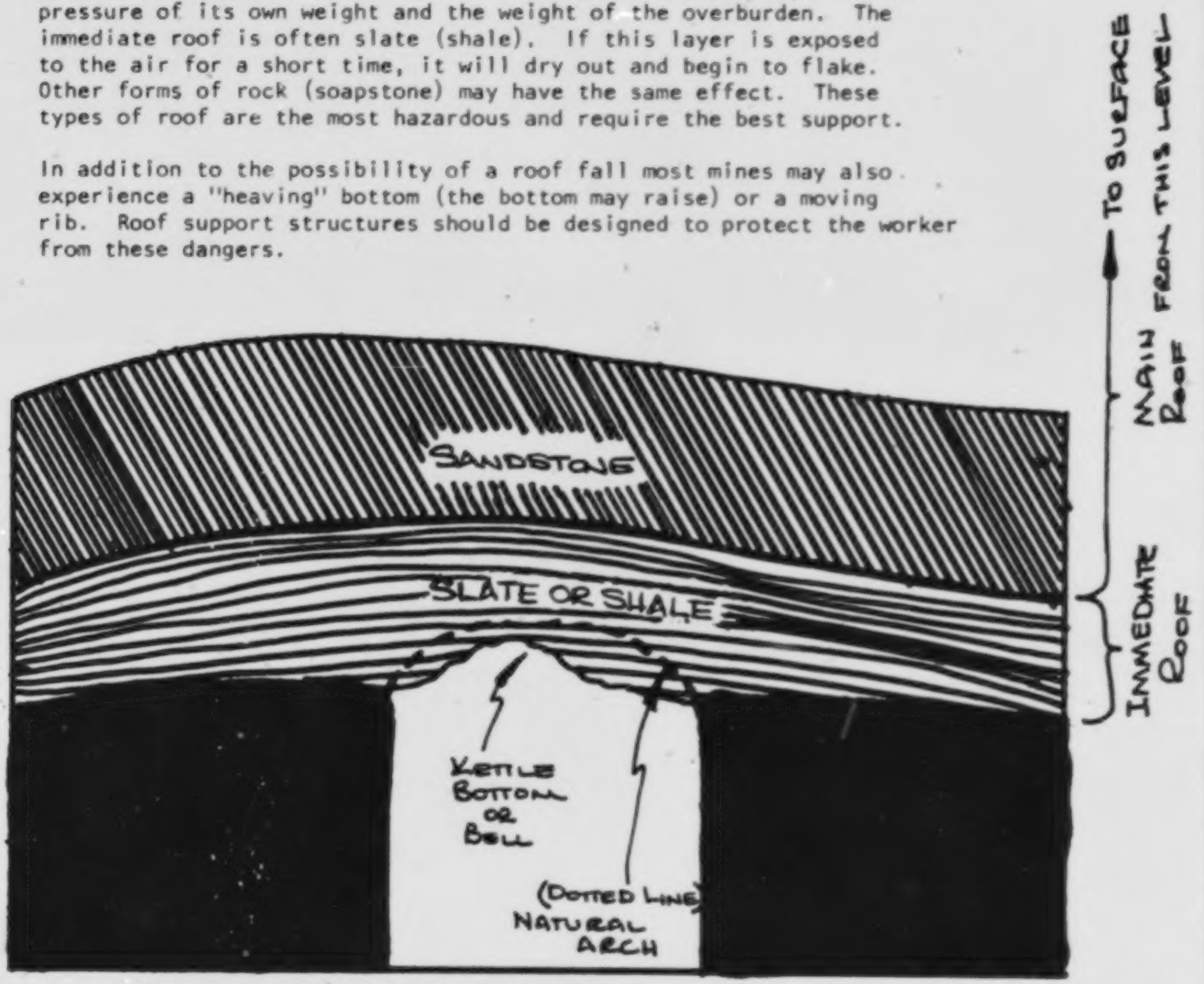

FIG. 2 MINE STRATA

Obviously, the best roof support would be to replace the coal with the same amount of solid rock. However, this is impossible and impractical. To support a wide variety of roof conditions safely and to leave enough room for men and machinery, three basic types of permanent roof support are utilized. Conventional support (timbering) is the established method of roof support. In this method, wood is the principle material. A more recent form of roof support is the use of roof bolts. A combination of roof bolting and conventional roof support, (props, crossbars, cribs etc.) is the third type of permanent roof support.

PROGRAM D-2 UNIT NO. 04 MODULE NO. 01 TASK NO. 010

The details of permanent roof support as well as temporary support will be described in the following sheets. The importance of proper roof support cannot be stressed enough. Roof support is every workers concern and responsibility.

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2 STUDENT NAME ______

UNIT 04 MODULE 01 TASK 020 INSTRUCTOR ______

DATE COMPLETED ______ INSTRUCTOR'S INITIALS ______

TASK TITLE: *Testing the Roof, Face and Ribs.*

Objective:

After studying the information sheet and a demonstration by Instructor, the student will safely and efficiently test the roof, face and ribs to decide whether there are corrections to make and answer the review questions to 90% accuracy.

Reference:

Demonstration by Instructor.

Tool:

1. Testing rod.

Procedure:

1. Read the objective more than once.
2. Demonstration by Instructor.
3. Study the illustration and the information sheet.
4. Answer all review questions.
5. Test the roof, face and ribs, following the safety rules. Decide whether or not the work area is solid.

Review Questions:

1. Who should test the roof, face and ribs of a working area?
2. What should a miner look for when visually examining an area?
3. Explain: Sound and vibration method.
4. What does a unsolid roof sound like when hit with a testing rod?
5. What does a solid roof sound like when hit with a testing rod?
6. Explain why vibration is useful in determining the roof condition.

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REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. Wayne Farabaugh

7. Why should both methods be used when determining the safety of the working area?

8. What safety rules should be followed when testing the roof, ribs and face of a working area?

9. How should a high area be tested?

10. What procedure should be followed when a dangerous area is found?

INFORMATION SHEET

Federal law (75.205) states that where miners are exposed to danger from falls of roof, face and ribs, the equipment operator will examine and test the roof, face and ribs before any work or machine is started, and as often after that as may be necessary to insure safety.

Dangerous conditions will be immediately reported to a foreman and corrected. Any miner, for his own assurance and safety, should make periodic checks.

There are two methods for testing the roof, face and ribs. Both methods should be used for a thorough examination.

SIGHT METHOD

To a careful miner, a visual examination of the roof, face and ribs is probably the most important examination. He should look for kettle bottoms, texture fractures, coal spallings and very wet rocks. He should also check for problems with the support system, such as bending of cross bars, timbers and posts, posts broken by pressure or cap pieces squeezed down over posts and decaying timbers.

SOUND AND VIBRATION METHOD

The sound and vibration method is an old but simple and important. The test involves hitting the mine roof with a solid object, such as a testing rod fitted with a metal cap, hammer or ax and then listening to the sound that is made.

When testing, the miner should always stand under a supported roof and then test only the roof to where the next support will be placed. With the fore fingertips of one hand on the surface of the roof, he should lightly tap the roof with the rod in the other hand. As he taps harder he will hear the sound of the roof and feel the vibrations with his fingertips. If the roof is solid, the vibrations will go through the roof smoothy and make a very clear, ringing sound. A hollow thud sound indicates loose rock or coal overhead. The vibrations are stopped by cracks or flaws in the rock. This type of roof must either be better supported or removed.

However, the sound and vibration method is not always foolproof as some roofs produce unrecognizable or misleading sounds. Also, the interference of noisy mining equipment may make the test impossible.

SAFETY RULES FOR TESTING ROOF

1. Protect the eyes with goggles.
2. Always stand under a supported roof when testing and only test to where the next support would be placed.
3. While testing, never turn your back to the face.
4. Always make sure there is a safe and clear line of retreat.
5. Be thorough, careful and
6. Examine the roof often while working.
7. Turn off the machinery when examining and testing.
8. For high places, use either a sturdy bench or long testing tool.

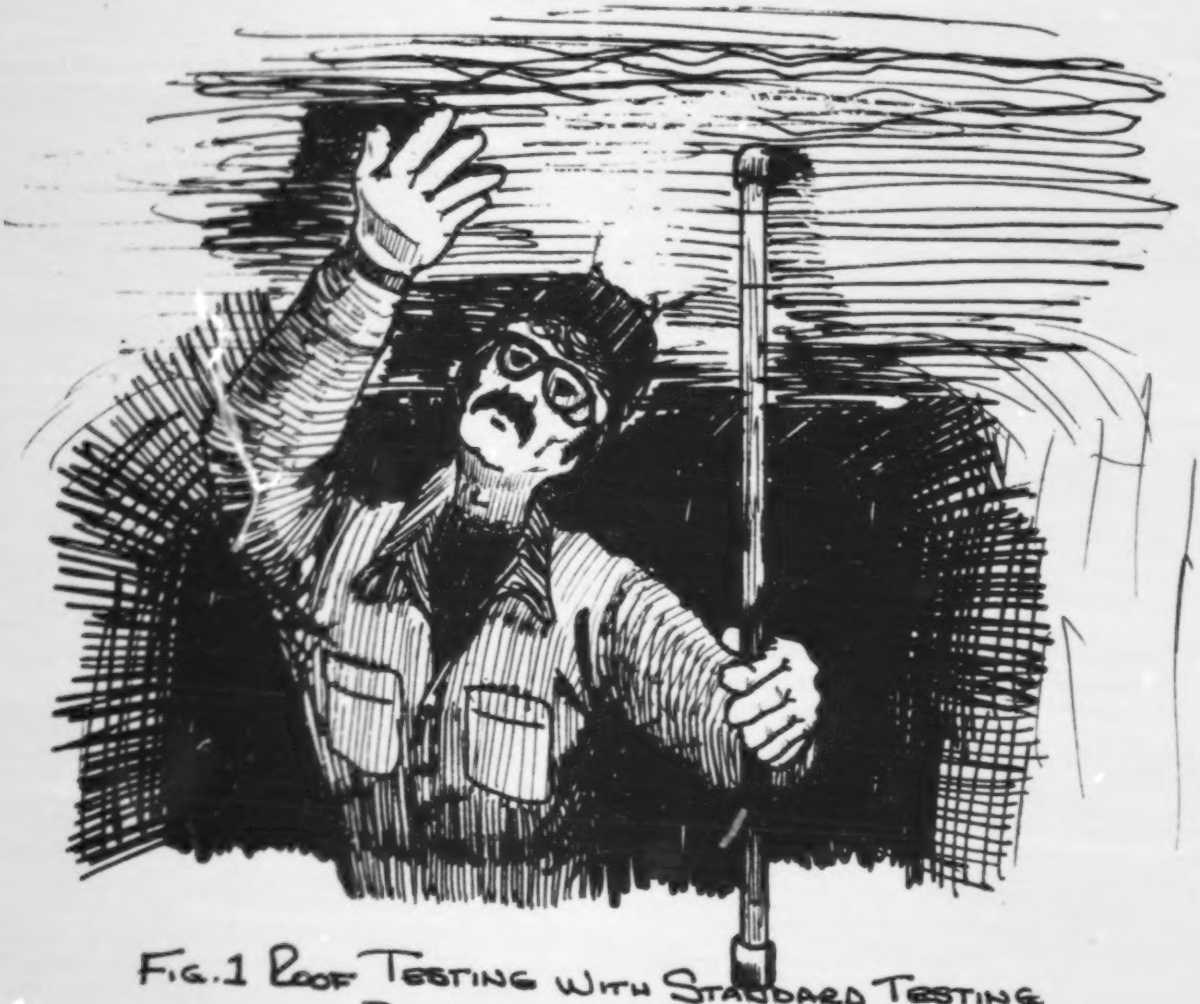

FIG. 1 ROOF TESTING WITH STANDARD TESTING ROD WITH METAL CAP

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PROGRAM D-2

UNIT 04 MODULE 01 TASK 030

DATE COMPLETED ______

STUDENT NAME ______

INSTRUCTOR ______

INSTRUCTOR'S INITIALS ______

TASK TITLE: *Testing Face For Trapped Water.*

Objective:
After studying the information sheet, the student will explain why and how a abandoned face is tested for gas and water by answering the review questions to 100% accuracy.

Introduction:
Before cutting through an old working section, it must be tested for gas and water to determine whether it is safe.

Procedure:
1. Read the objective at least twice.
2. Read the introduction at least twice.
3. Study the information sheet.
4. Answer all review questions.

Review Questions:
1. Why must boreholes be drilled into an abandoned face?

2. Briefly describe how to test for trapped water and gases.

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P 1 OF 2

REVIEWED & APPROVED

RESEARCH ______ INSTRUCTOR ______ ADMINISTRATION ______

PREPARED BY: Mr. L. Thomas Gailey

PROGRAM D-2 UNIT NO. 04 MODULE NO. 01 TASK NO. 030

INFORMATION SHEET

According to federal law 75.1701, whenever any working place approaches within 50 feet of abandoned areas or within 200 feet of abandoned area which cannot be inspected or any workings of a adjacent mine, boreholes must be drilled at least 20 feet in advance of the face and continually maintained to a distance of at least 10 feet ahead of the advancing face. Boreholes must be drilled not more than 8 feet apart in the ribs to the distance of at least 20 feet at a 45° angle.

Generally, a hydraulic drill or a compressed air drill is hooked onto a roof bolter and used to drill boreholes (See fig. #1); one on top to test for gas and two close to each other on the bottom to test for water. If gas or water is detected, the holes are immediately filled and that working face is abandoned.

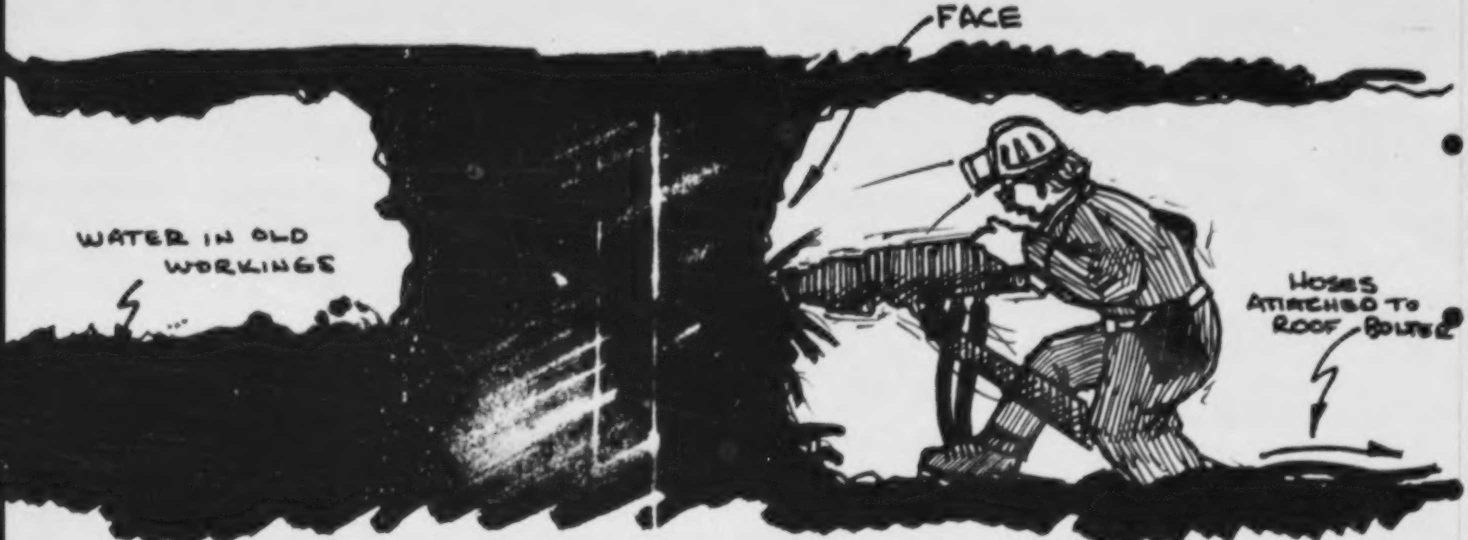
FACE
WATER IN OLD WORKINGS
HOSES ATTACHED TO ROOF BOLTER

FIG. 1 TESTING FACE FOR WATER WITH DRILL.

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PROGRAM D-2
STUDENT NAME
UNIT 04 MODULE 02 TASK 010
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *How to set Props for roof support,*

Objective:

After studying the material, the student will demonstrate his ability to properly place posts or props safely and to the satisfaction of the instructor. The student will also answer the review questions accurately.

Materials and Tools:

1. One sledge hammer
2. One hand saw
3. One wooden support post or prop
4. Two wooden wedges (cap pieces)
5. One shovel
6. One 2" x 4" wooden plank at least 5 feet long (if necessary)

Procedure:

1. Study the information sheet.
2. Following the instruction, set several props (if required by the instructor).
3. Direct any questions about the material to the instructor.
4. Answer the review questions.

Review Questions:

1. Name three advantages gained by using the timbering method.

2. Why should the miner never work beyond the last permanent roof support?

3. When may the worker go beyond the last roof support? How far beyond?

4. Why should cap pieces be used? Where?

5. When should a header be used?

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REVIEWED & APPROVED RESEARCH MSK INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. Wayne Farabaugh

INFORMATION SHEET

Wooden props are very useful as roof supports. Not only do wooden props support well, but they also give the worker a warning of increased roof pressure which will cause a roof fall. When the pressure is increased on a wooden prop, the prop will bow or bend before it breaks. Also, the wooden prop will make loud cracking sounds as the pressure increases.

If a worker notices the sound of the cracking wood or the prop bending, he should quickly notify a section foreman who will clear the section if a roof fall is apparent. A violent snapping of wood, warns the worker that a roof is falling nearby and he should move quickly out of the section. As an early warning of roof pressure, the worker should examine the cap pieces. Increased pressure on the prop will force the cap pieces down over the top of the prop.

The strength of the prop depends on the type of wood used and the shape. Square props are stronger than round props. (But also more expensive and seldom used.) The type of wood generally used, depends on the location of the mine and the type of trees growing nearby. Some of the more common varieties of wood used for props are: birch, ash, beech, oak and hickory.

These props may be treated with creosote or other chemicals to prevent them from rotting quickly. (Treated timbers last about 10 years and untreated timbers seldom last more than three years.)

Wooden props are also widely used because they may be cut easily. This quality of wood is especially useful when timbering uneven roofs. Each prop may be easily cut to fit snugly.

Instructions for setting Props:

1. Review the roof control plan or systematic timbering plan.
2. Locate the last permanent roof support. (Never go beyond the last permanent roof support, unless you are setting roof supports. In that case, work from the last permanent roof support toward the face. Never begin at the face and work back.)
3. Locate the place where the prop must be set. (Most props are set four feet from the rib and four feet from the last prop. However, some systematic timbering plans may be different.)
4. Test the roof.
5. Examine the bottom of the mine where the prop must be set. Whenever possible, the prop should be set on a solid bottom. (If the bottom is solid a few inches down, shovel the spot clean. If a solid surface cannot be found, a 2 inch by 4 inch by 1 foot plank may be used as a footer.) (See figure #1)
6. Measure the distance from the bottom or footer to the roof. (Since most miners do not carry a rule, a rough measurement can be made using the ax or sledge handle.
7. Cut the prop (if necessary) to fit loosely between the bottom and the roof.
8. Stand the prop (straight up) and drive a wedge (cap piece) between the roof and the top of the prop. Drive the wedge until the prop is snug and stable. (If necessary to make the prop fit snugly, drive another wedge or cap piece from the opposite side on top of the first as shown in Fig. #1.)

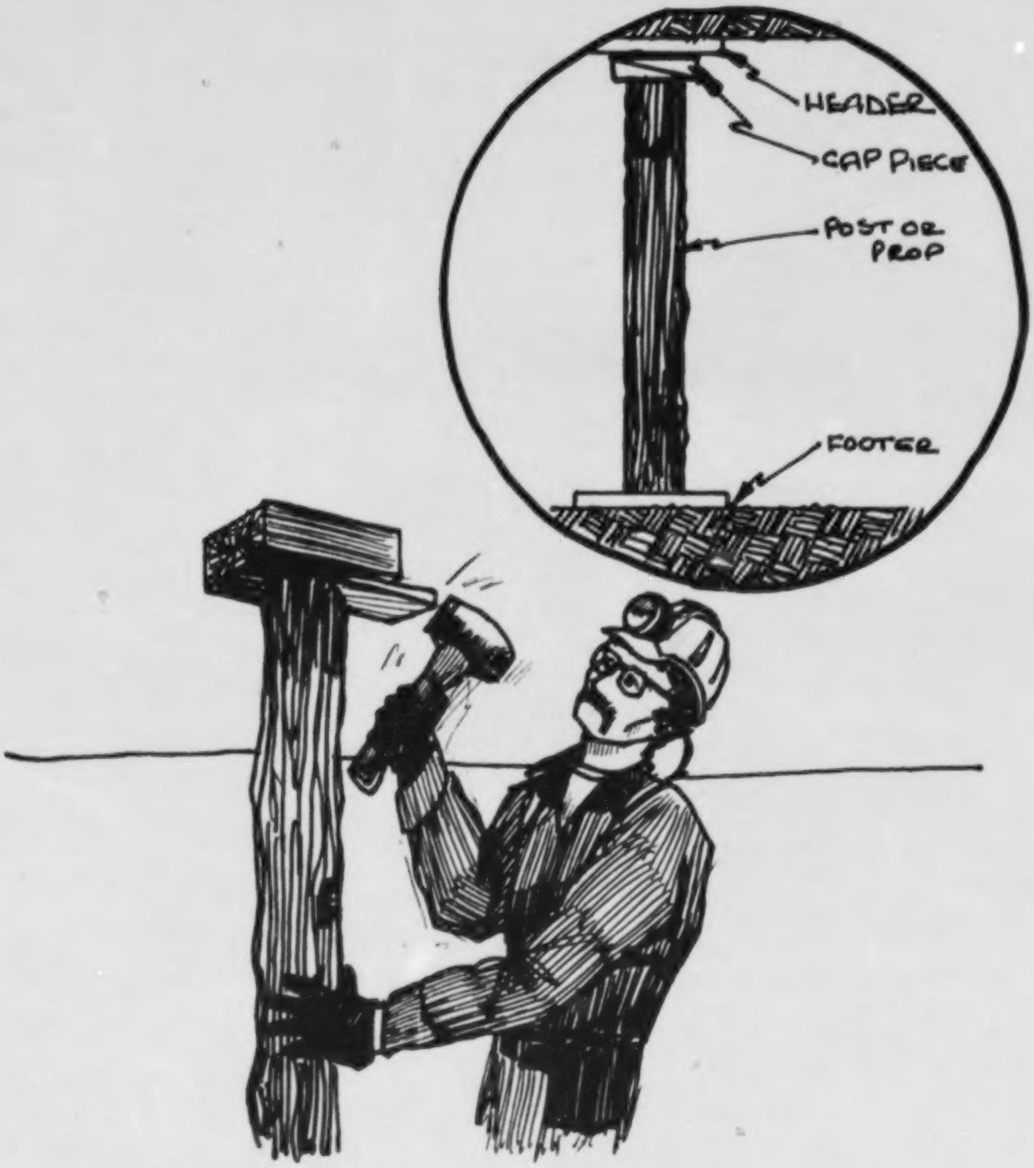

HEADER
CAP PIECE
POST OR PROP
FOOTER

FIG. 1 INSTALLING A SUPPORT POST & IDENTIFICATION OF MATERIAL

9. In some cases, a header or cap block may be used to help support loose or rough roof. This header will vary in length depending on different roof conditions, and cap pieces may be used to fill the uneven portions of roof (See Fig. #2). (Remember, that cap pieces must always separate the prop and the header.)

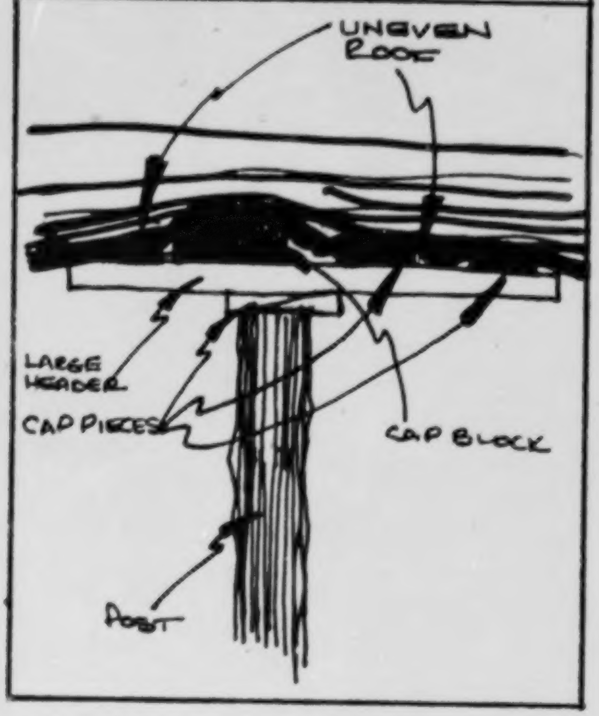
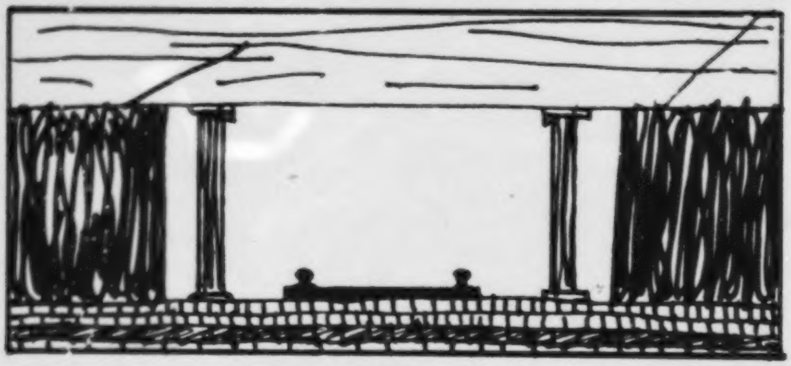


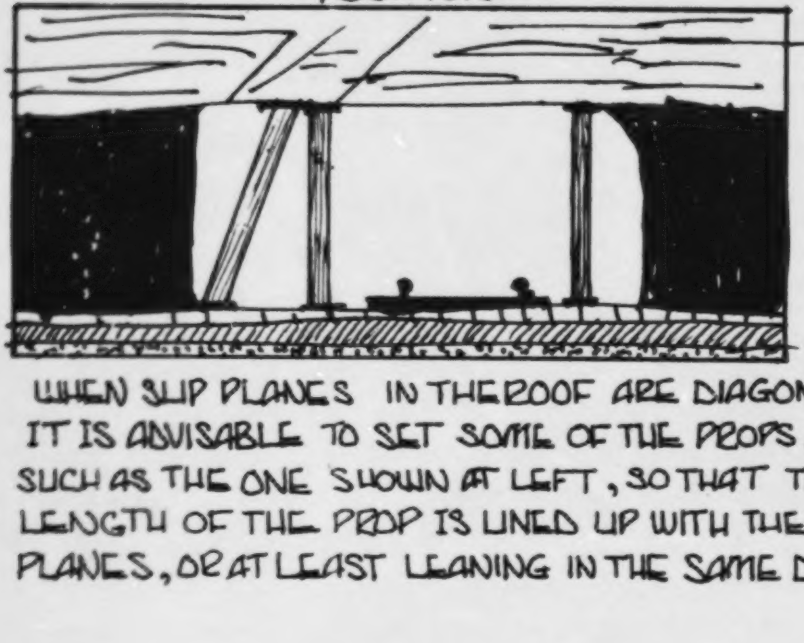
FIG. 2. METHOD OF APPLYING PROPS TO UNEVEN ROOF.

Wooden props are also easy to set at peculiar angles when timbering imperfect roofs. For example, many roofs contain slip planes or faults. As shown in Fig. #3, the props may be set at an angle parallel to the slip or at least in the same direction. This method provides additional support to the roof but should be used next to vertical props to insure safety.

FIG.3 PROPPING A SLIP PLANE



PROPS ARE USUALLY SET IN AN UPRIGHT POSITION



WHEN SLIP PLANES IN THE ROOF ARE DIAGONAL, IT IS ADVISABLE TO SET SOME OF THE PROPS, SUCH AS THE ONE SHOWN AT LEFT, SO THAT THE LENGTH OF THE PROP IS LINED UP WITH THE SLIP PLANES, OR AT LEAST LEANING IN THE SAME DIRECTION.

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PROGRAM D-2 STUDENT NAME

UNIT 04 MODULE 02 TASK 020 INSTRUCTOR

DATE COMPLETED INSTRUCTOR'S INITIALS

TASK TITLE: *How to set crossbars for roof support.*

Objective:

After studying the material, the student will demonstrate his ability to assist in setting crossbars and understand the purpose of crossbars to the satisfaction of the instructor. The student will also answer all review questions to 80% accuracy.

Introduction:

The process of setting crossbars cannot be done by one worker. Since general miners are required to be accompanied by an experienced miner for the first year of employment, work crews including experienced miners are generally orgainized and assigned the task of setting crossbars.

Materials and Tools:

1. One sledge hammer
2. One hand saw
3. Two support props
4. Four wedges or cap pieces
5. One crossbar

Procedure:

1. Read the objective.
2. Read the introduction.
3. Following the instructions, set crossbars (if tools, materials, etc. are available).
4. Answer the review questions.

Review Questions:

1. Where should crossbars be used?

2. Name three advantages of wooden crossbars.

3. Why must cap pieces or blocks be used between the crossbar and an uneven roof?

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REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. Wayne Farabaugh

PROGRAM D-2 UNIT NO. 04 MODULE NO. 02 TASK NO. 020

INFORMATION SHEET

Crossbars distribute the weight and pressure of the immediate roof over the entire length of the crossbar. Therefore, crossbars can support a greater weight or a greater area of roof. For this reason, crossbars are generally used over sections of weak roof or in wide entries (main haulageways). To support the same amount of roof (using only props), would require that props be set at regular spaces across the entire width of the entry. Since this would cut down on the space for tracks and equipment, crossbars are more logical. (Even though crossbars cut down on the area from the roof to the bottom or floor.)

Although metal crossbars are manufactured and used in mines, (some mines use mine tracks as crossbars) wooden crossbars have several advantages.

1. Wooden crossbars are less expensive and easier to set than metal crossbars.
2. Wooden crossbars (like wooden props) will bend and make noise when the roof pressure increases and warn the miner of a possible rock fall. (Steel crossbars will snap without warning.)

The only real disadvantage of wooden props is that they will rot (even though they may have been chemically treated) in a few years. However, steel rails or crossbars will corrode when exposed to mine water for a few years. So the type of crossbar used depends on the mine conditions and the roof control plan.

Federal law (75.200-8) specifies the minimum requirements for size and use of crossbars. Each crossbar must be at least 3 inches wide. Entries, over 20 feet wide, cannot be supported by timbering (crossbars, props) alone.

Instructions:

1. Review the roof control plan or the systematic timbering plan for the mine.
2. Locate the last permanent roof support. (Work from that roof support toward the face. Never begin at the face and work back.)
3. Test the roof and scale down all loose rock.
4. Measure and cut the crossbar to fit from rib to rib (See figure #1) along the roof. (The crossbar does not necessarily have to fit snugly but must be long enough to lay on the props.)
5. Raise the crossbar and support it. (Many methods may be used to raise and support the crossbar. Some of the more common methods of raising crossbars are: the worker may simply lift it, the crossbar may sit on the head of a continuous miner, or the bed of a shuttle car, hydraulic or mechanical jacks, or machines specifically designed for lifting crossbars as shown in figure #2).
6. Set the props under each end of the crossbar. (Follow the instructions for setting props.) These props must be cut to support the crossbar snugly against the roof and level.

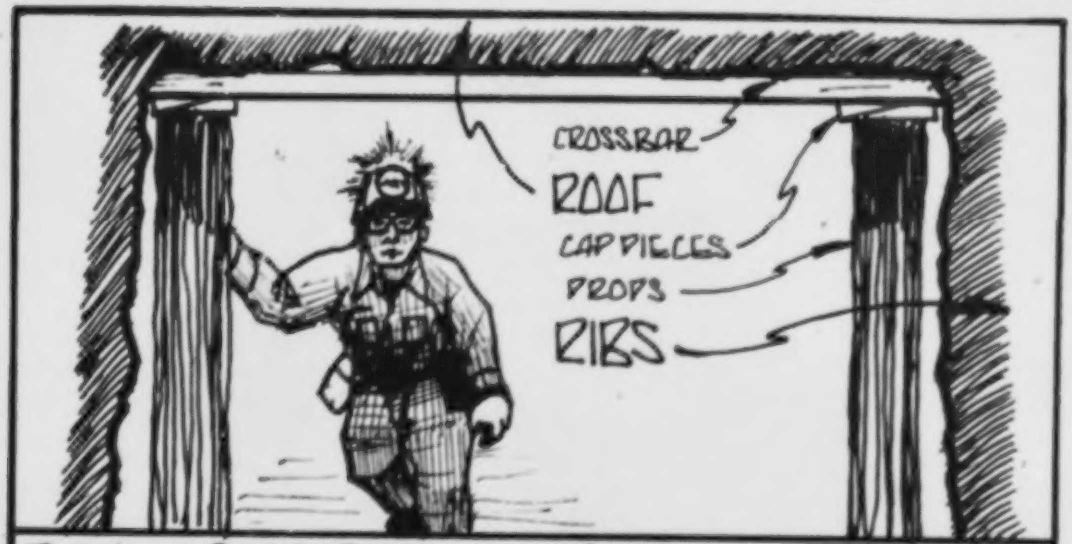
CROSSBAR
ROOF
CAP PIECES
PROPS
RIBS

FIG.1 CROSSBAR and PROPS

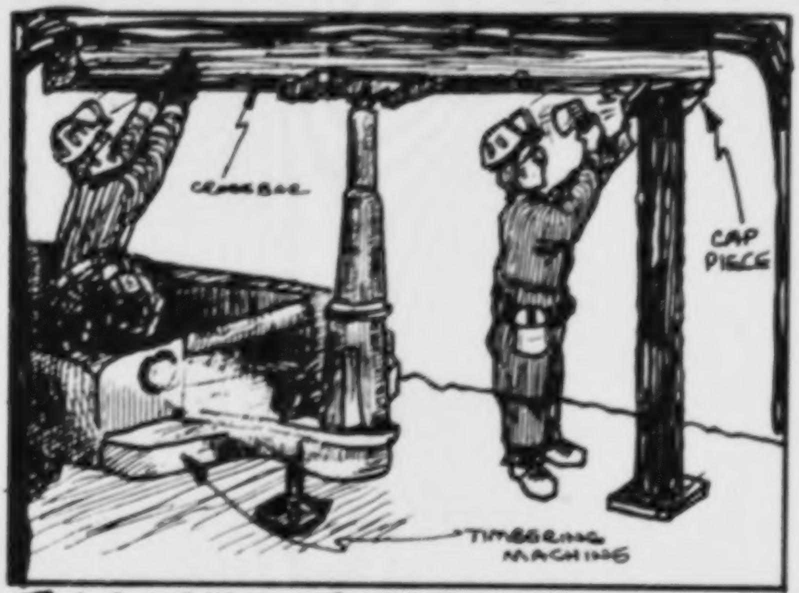
CROSSBAR
CAP PIECE
TIMBERING MACHINE

FIG.2 USING A TIMBERING MACHINE

7. If the roof is uneven and the crossbar does not touch sections of the roof when leveled a crib block or cap piece will have to be driven between the crossbar and roof. (Blocks and cap pieces are shown in Figure #3. A crib involves a much larger roof section and will be discussed in detail in another task sheet.)
8. Drive a cap piece between the crossbar and prop until the bar is snug.

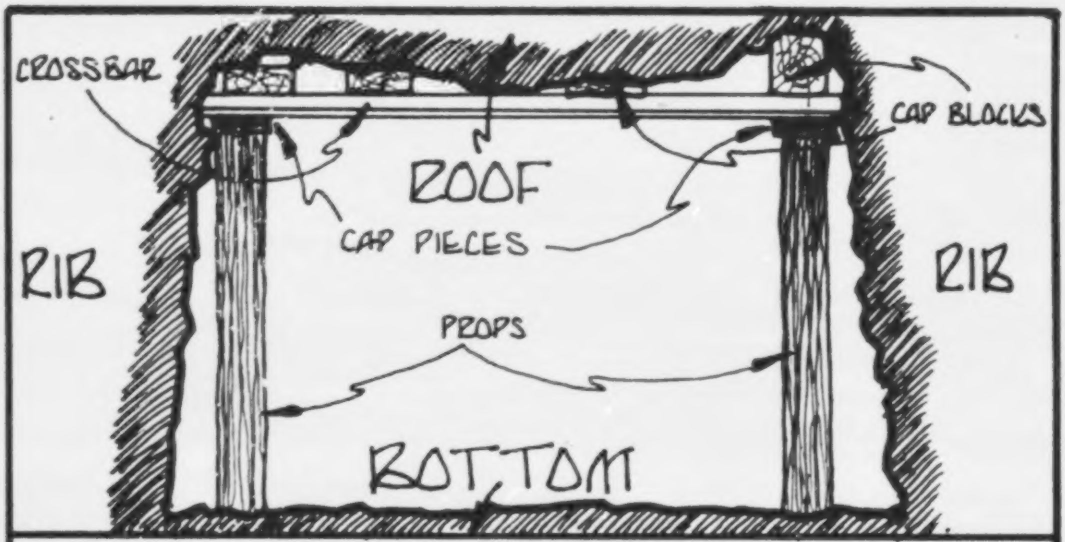
CROSSBAR
CAP BLOCKS
ROOF
CAP PIECES
RIB
RIB
PROPS
BOTTOM

FIG.3 CROSSBAR w/CAP PIECES and BLOCKS

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EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
UNIT 04 MODULE 02 TASK 030
DATE COMPLETED ______

STUDENT NAME ______
INSTRUCTOR ______
INSTRUCTOR'S INITIALS ______

TASK TITLE: *How to build cribbing for roof support.*

Objective:

After studying the material, the student will demonstrate his ability to build cribbing for roof support to satisfaction of the instructor. The student will also answer all review questions accurately.

Materials and Tools:

1. Sledge hammer
2. Hand saw
3. One shovel
4. At least 10 cap pieces
5. Crib blocks (The number and size of the blocks depends on the size of the structure needed.)

Procedure:

1. Study the information sheet and illustrations.
2. Following the instructions, construct a bottom to roof crib (if required by the instructor).
3. Direct any questions about the material to the instructor.
4. Answer the Review Questions.

Review Questions:

1. What is the minimum size of a crib?
2. What is "squeeze"?
3. When are cribs used?
4. Why are certain non-working sections permitted to collapse?

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DATE 5/11/77
P 1 OF 4

REVIEWED & APPROVED RESEARCH M&K INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. Wayne Farabaugh

PROGRAM D-2 UNIT NO. 04 MODULE NO. 02 TASK NO. 030

INFORMATION SHEET

Crib blocks are square pieces of wood or planks, which vary in size depending on the weight, pressure and area which must be supported. When arranged in log cabin style, these crib blocks form a structure called a crib (chock, cog.) As a method of timbering, cribs are valuable, since the crib may support extreme weight. Cribs are used most often in longwall mining to support the roof while a pillar is being removed. (Cribs are also used in other forms of mining in sections of bad roof or extreme pressure.)

Different roof conditions require a different style or size of crib. For this reason, two different procedures are given in this task sheet

Bottom to roof cribs are used to prevent the spread of a squeeze. Squeeze is a condition that happens when the pressure of the overburden (upper roof) is too strong and crushes the pillars and man made support. Short, thick (sometimes over a foot thick) crib blocks are stacked to suppport the roof in working sections. Occasionally, the cribs will be placed to protect working sections while other nearby sections will be permitted to cave. This method will help relieve the pressure over the working section.

Instructions for bottom to roof cribbing

1. Locate the section and place where the crib is to be built.
2. Shovel the bottom and clear away all loose rock. (Try to make the bottom as level and even as possible. Solid rock is the best bottom for cribbing.)
3. Lay two crib blocks on the bottom, Position the blocks parallel to each other and far enough apart to lay a second row of blocks on top, spanning the first row. (See fig. 1)

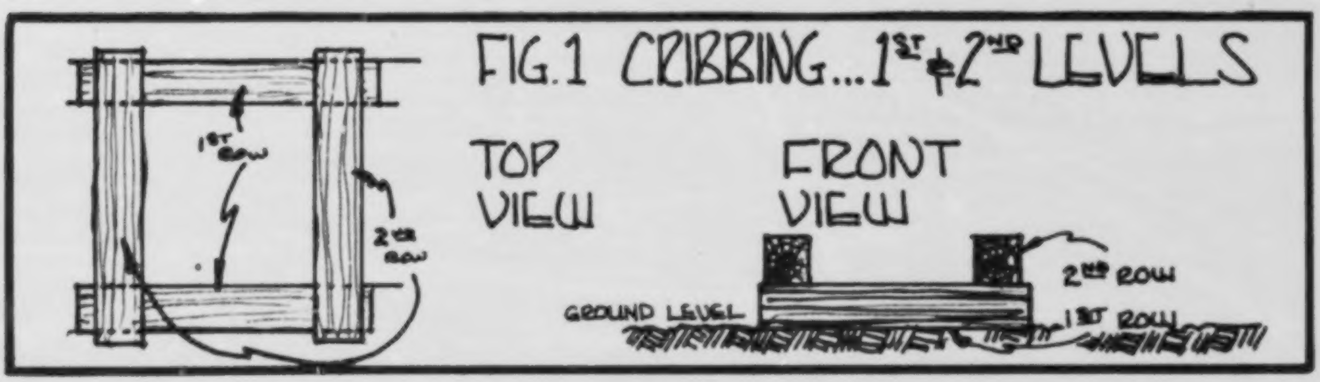


FIG.1 CRIBBING...1ST & 2ND LEVELS

4. Lay the second row of crib blocks (log-cabin style) on the top of the first row.
5. Continue laying each row of crib blocks (opposite direction for each new row) until the roof has been reached.
6. Beginning at the bottom (first row) of the crib drive wedges between crib blocks to level each row. (Only put cap pieces where necessary to level the structure and never use two or more cap pieces in the same place.)
7. Snug the final row to the roof by driving cap pieces under that row. Fill in the gaps between the final row and the roof with cap pieces or block. (See fig. 2)

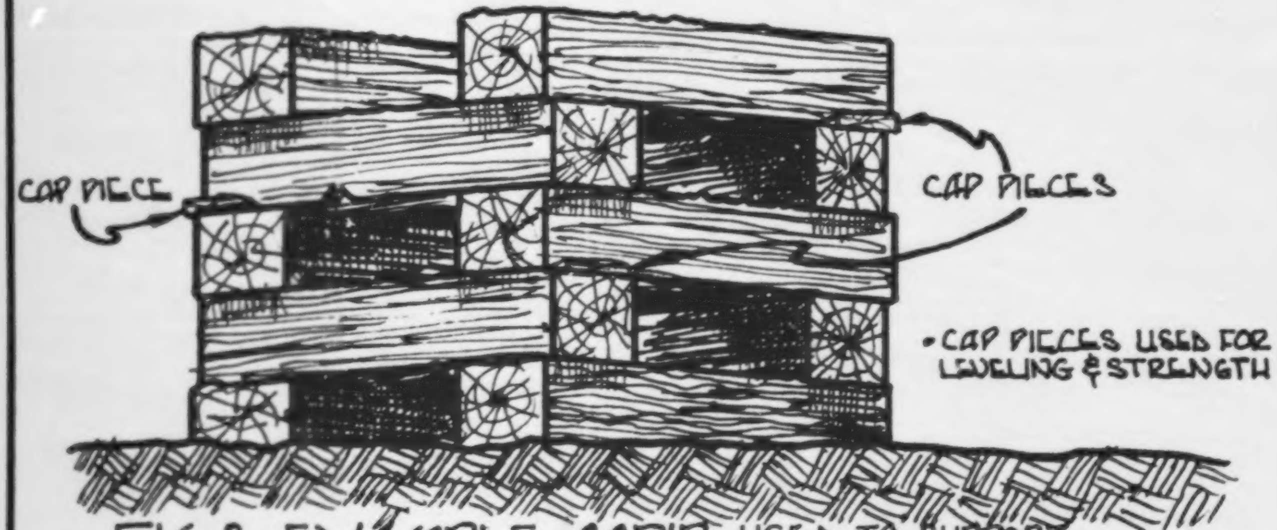
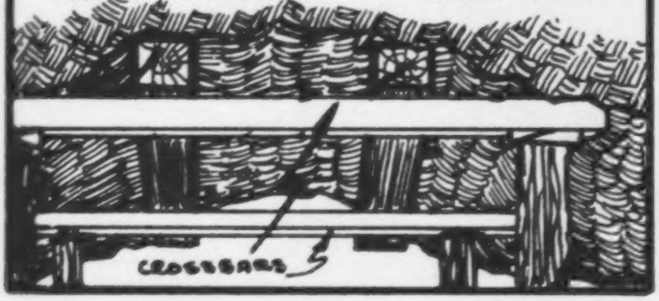

CAP PIECE
CAP PIECES
• CAP PIECES USED FOR LEVELING & STRENGTH

FIG. 2. EXAMPLE of CRIB USED TO SUPPORT HEAVY ROOF LOADS

The process of removing coal from an entry forms a natural arch over the entry (See fig. #3). Over a period of time, this natural arch may collapse, and the support props or crossbars may not give proper roof support. In this case, cribbing may be built on top of the crossbars to support the entry and machinery may move through it easily.

FIG. 3 CRIBBING • HORSEBACK

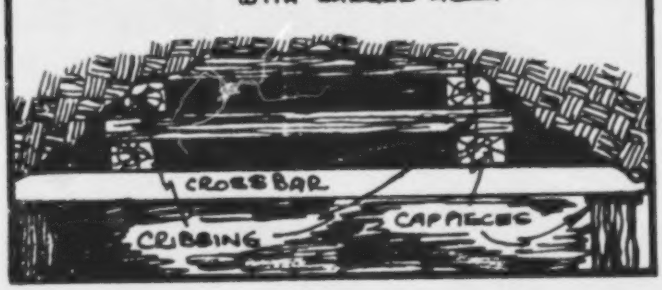


Instructions for crossbar to roof cribbing

1. Lay two crib blocks extending from one crossbar to the next crossbar, directly under the roof section to be supported. (See Fig. 3)
2. Separate the two crib blocks far enough apart to lay the second row from one first row block to another with no more than a few inches of block exposed.
3. Continue laying each following row opposite the row under it, until the crib is touching the roof.
4. Level each row of the crib with cap pieces. (Step #6 of the first procedure.)

5. Snug the final row to the roof by driving cap pieces under that row. Fill in the gaps between the final row and roof with cap pieces or block. (Fig. 4)

FIG 4. CRIBBING a HORSEBACK WITH LARGER AREA


CROSSBAR
CRIBBING
CAP PIECES

If the entire arch has fallen, two separate cribs may be built on top of the crossbars. (See fig. 5) However, under no condition may any crib be less than 30 inches square.

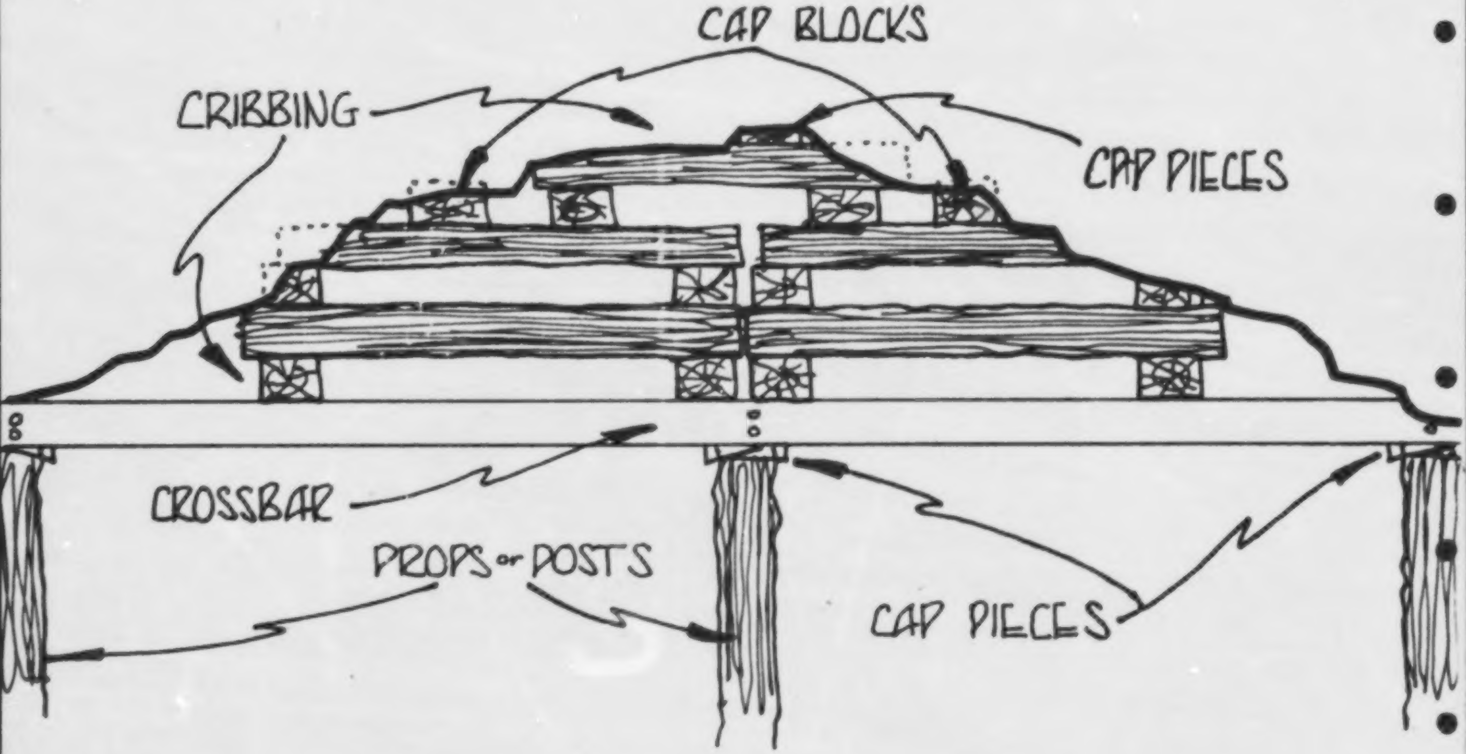

CAP BLOCKS
CRIBBING
CAP PIECES
CROSSBAR
PROPS or POSTS
CAP PIECES

FIG.5 TWO CRIBS SUPPORTING A LARGE HORSEBACK

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EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2 STUDENT NAME __________

UNIT 04 MODULE 02 TASK 040 INSTRUCTOR __________

DATE COMPLETED __________ INSTRUCTOR'S INITIALS __________

TASK TITLE: *Roof Bolting.*

Objective:

After studying the material, the student will understand the basic principles involved in roof bolting to the satisfaction of the instructor by answering the review questions to 80% accuracy.

Introduction:

The task of setting roof bolts is performed by an operator, his helper and machinery designed for setting roof bolts. General workers are not involved in setting roof bolts, but should be aware of their purpose and the basic principles of roof bolting. This task sheet does not teach the student how to set roof bolts.

Procedure:

1. Read the Introduction twice.
2. Study the information sheet
3. Answer the review questions.

Review Questions:

1. What are some of the advantages of roof bolting?

2. Name and describe the three types of roof bolts.

3. Who will set roof bolts?

4. What are the two methods of roof bolting? Briefly explain each.

5. Name two advantages of resin bolts.

6. How far (maximum) are roof bolts set from each other?

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REVIEWED & APPROVED RESEARCH ____ INSTRUCTOR ____ ADMINISTRATION ____

PREPARED BY: Mr. Wayne Farabaugh

7. To determine the size and style or roof bolts that will be used in a particular mine, what information is needed?

INFORMATION SHEET

Roof bolting is the most common form of permanent roof support. (About 80% of the coal mines in the United States use roof bolting.)

There are several reason why roof bolting is so popular.

1. Roof Bolting requires less space than conventional roof support. (Therefore, there is less resistance for ventilation and more room to move men and machinery.)

2. Roof Bolts last longer than conventional support.

3. Roof Bolts can be used in rugged roof areas without special changes.

4. Roof Bolting may be used effectively for control of a "soft" roof.

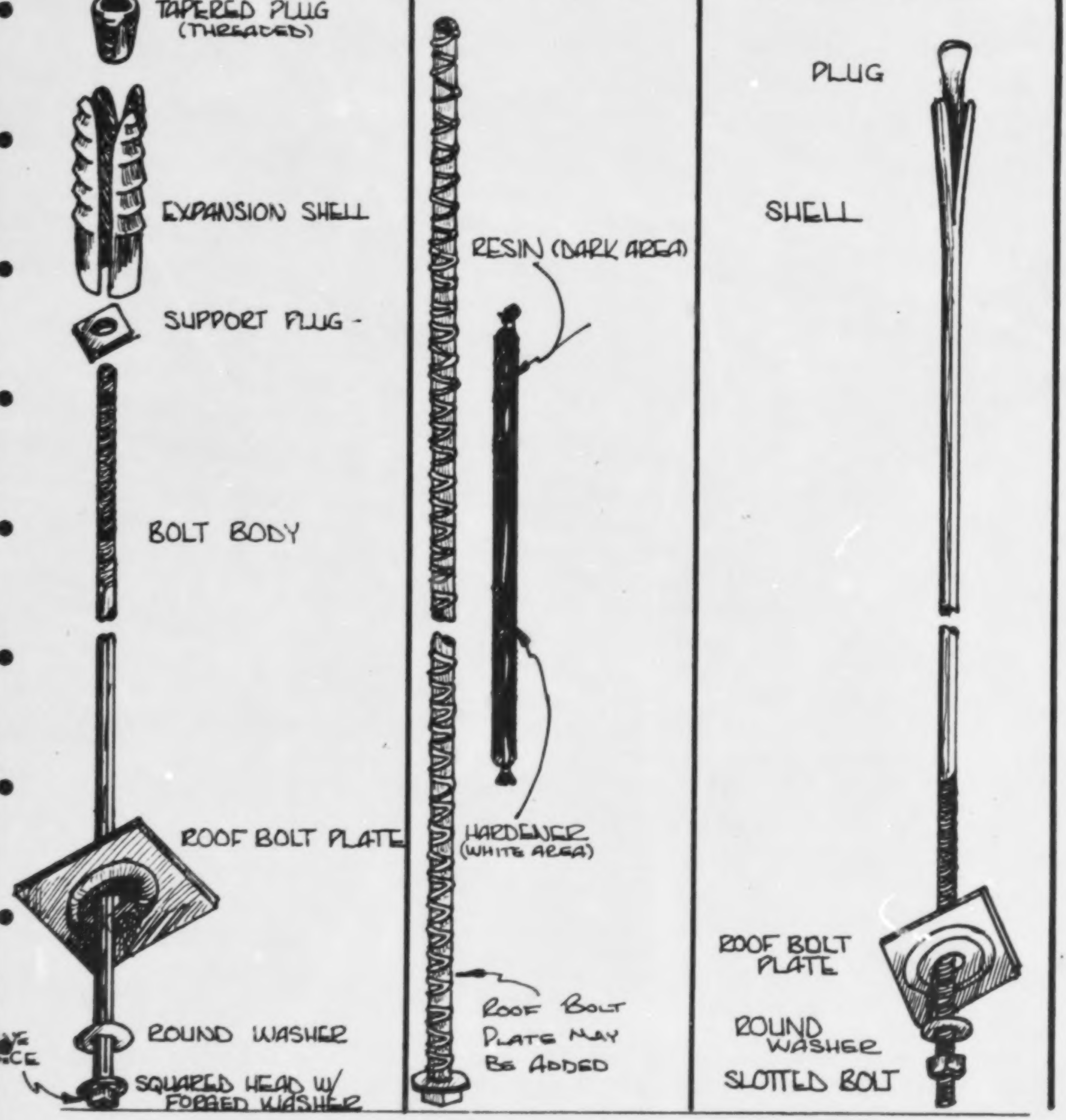
There are three basic types of roof bolts; expanding shell roof bolts, slotted rock bolts and resin bolts. (See fig. #1) Each type of roof bolt is set by the same type of equipment (Fig. #2 or Fig. #3) and looks generally the same after each has been set. However, each type has special advantages and are used for different roof or rib conditions.

The explanding shell roof bolt is probably the most common of the three types. After locating the position for the roof bolt, the worker will drill a hole (with a roof bolting machine or portable drill) and insert the roof bolt, shell and plate exactly as shown in Fig. #1. As the bolt is tightened, (with a roof bolting machine, power wrench or ratchet) the tapered plug will be pulled down onto the bolt and expand the shell. The expanded shell will grip the sides of the hole and hold the bolt tightly in place.

Rock bolts are used when the immediate roof or rib is solid rock. (Since very few coal seams are located beneath this type of rock layer, rock bolts are used very seldom.) The procedure for setting rock bolts are generally the same as the procedure for setting expansion bolts. However, rock bolts cannot always be set the same distance into the roof. (Since it may be difficult to drill very far into the roof.) For this reason, rock bolts do not have a fixed head and may be tightened with much more of the bolt exposed.

Occasionally, the roof may be a "soft" form of rock (slate, soapstone, etc.). Expansion bolts cannot get a firm hold into this type of roof and the support is not effective. Resin bolts are used in this type of roof. Using resin bolts, the roof bolt is actually "glued" into place. However, this "glue" hardens quickly (a little over 5 minutes for complete drying) and is extremely strong.

FIG.1 EXPANSION ROOF BOLT | RESIN ROOF BOLT | ROCK ROOF BOLT


TAPERED PLUG (THREADED)
EXPANSION SHELL
SUPPORT PLUG -
BOLT BODY
ROOF BOLT PLATE
ROUND WASHER
SQUARED HEAD W/ FORGED WASHER
RESIN (DARK AREA)
HARDENER (WHITE AREA)
ROOF BOLT PLATE MAY BE ADDED
PLUG
SHELL
ROOF BOLT PLATE
ROUND WASHER
SLOTTED BOLT

- USED PRIMARILY IN HIGH COAL

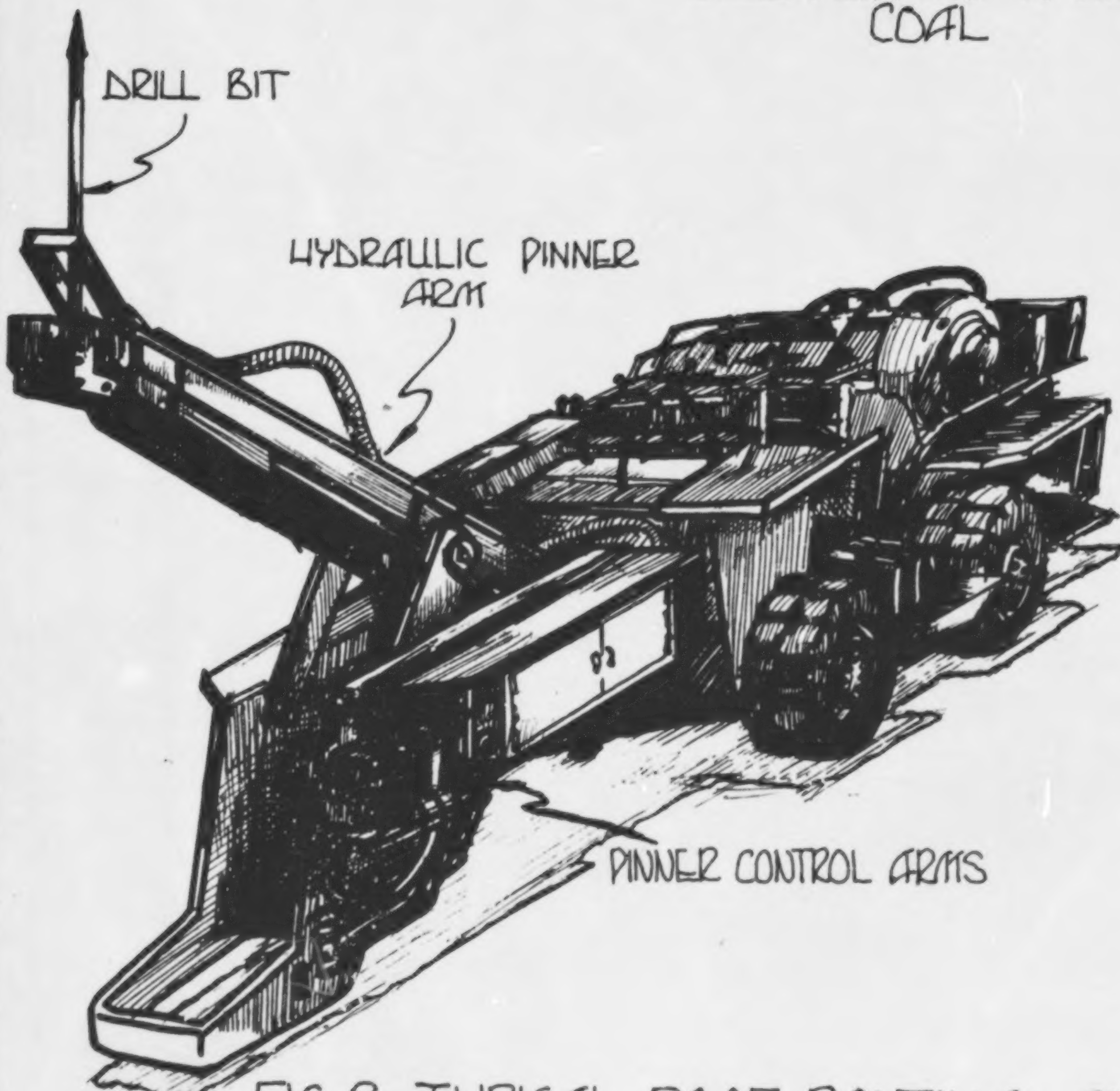
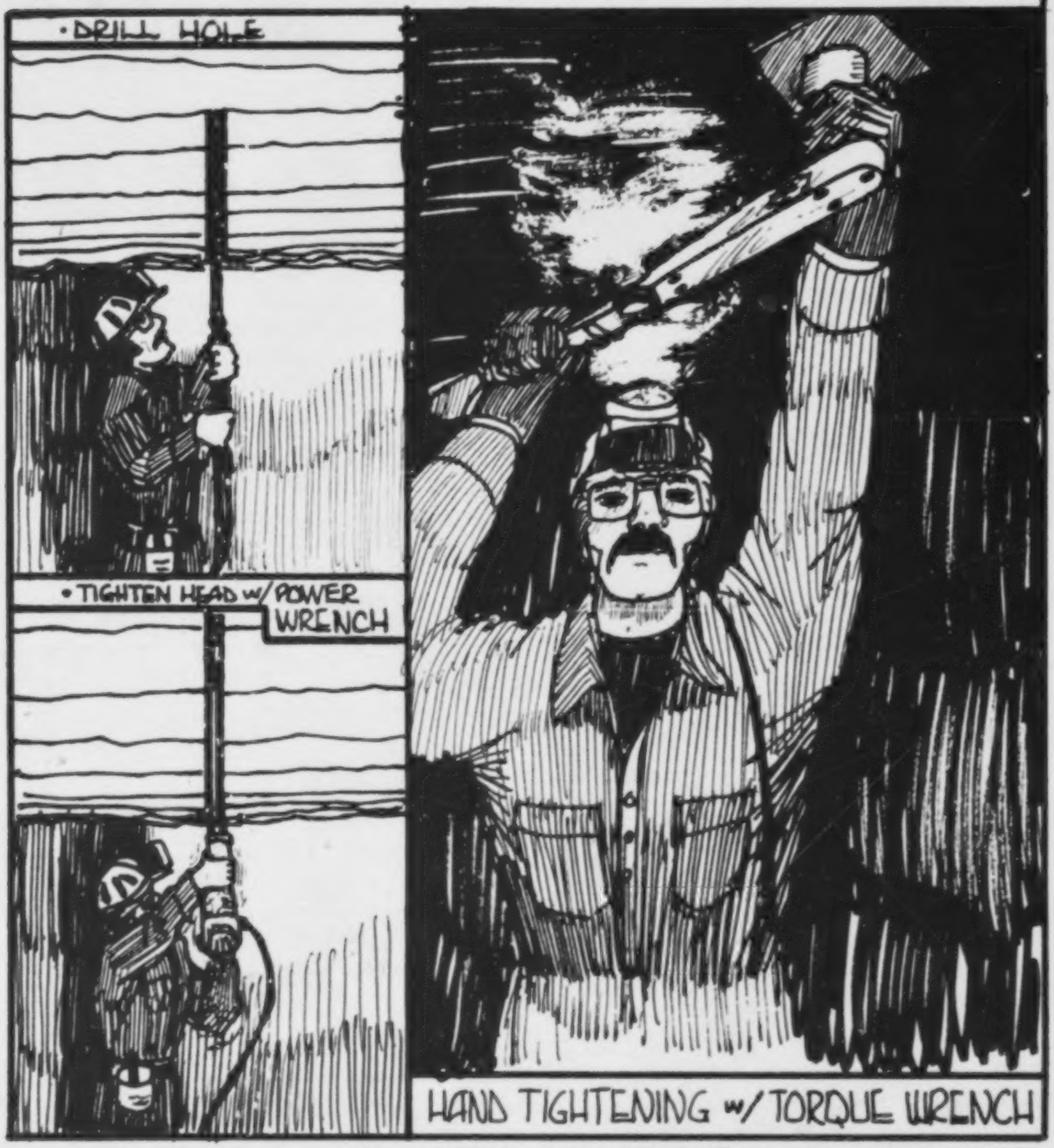

DRILL BIT
HYDRAULIC PINNER ARM
PINNER CONTROL ARMS

FIG.2 TYPICAL ROOF BOLTING MACHINE
OPERATED FROM THIS POSITION

FIG.3 ROOF BOLTING BY HAND


• DRILL HOLE
• TIGHTEN HEAD w/ POWER WRENCH
HAND TIGHTENING w/ TORQUE WRENCH

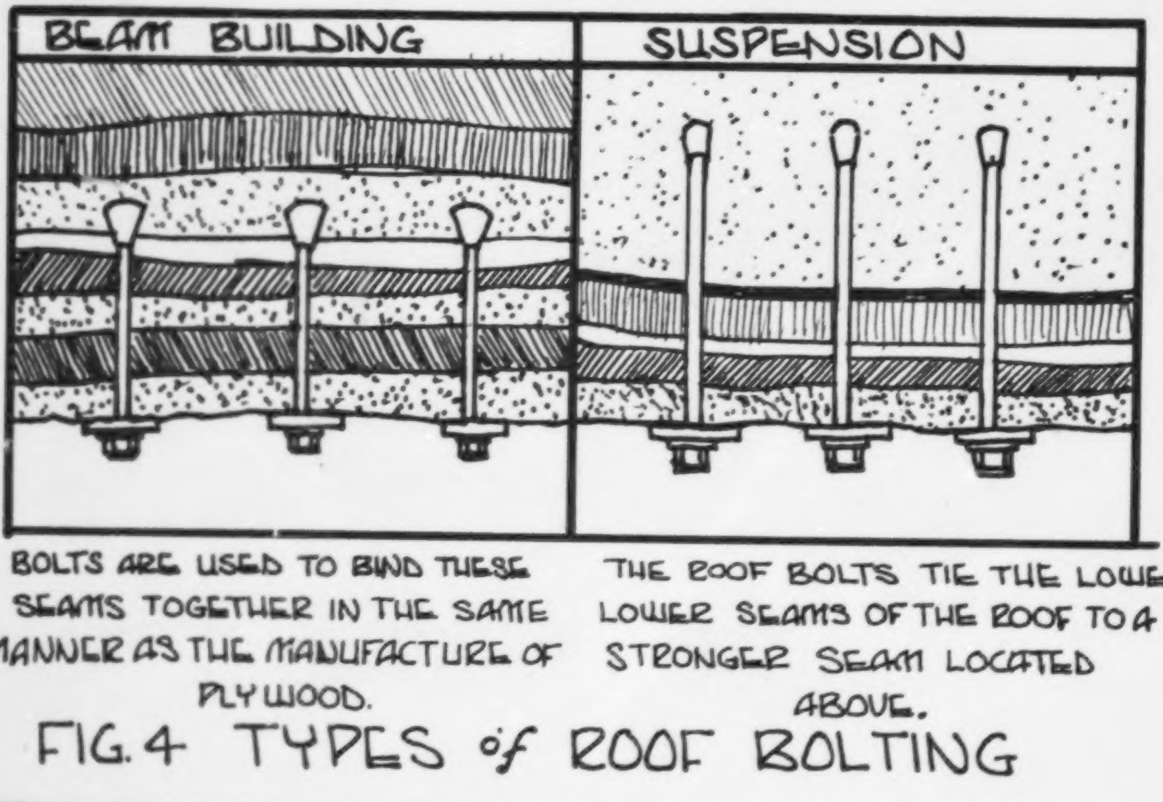
• BOLTS CAN BE PUT IN, OR JUST TESTED WITH THE TORQUE WRENCH.

Setting resin bolts is fairly simple. The hole is drilled exactly the same size as the bolt. A tube of resin (See fig. #1) is inserted into the hole and followed by the bolt and plate. When the bolt is driven into the hole, the resin tube will break allowing the catalyst (hardener) and the resin to mix. As the bolt is turned, the ridges on the outside of the bolt mix the resin and catalyst, forces the mixture along the entire length of the bolt and seals all the cracks in the roof caused by drilling. When the mixture has dried, a permanent seal is formed and the roof bolt is secure. (The bolt must be held in place for about 30 seconds to permit the resin to harden enough to prevent the bolt from falling.)

Resin bolts must be set soon after the coal has been removed. If the roof has been given time to sag, the resin bolts will not be effective.

There are basic methods of roof bolting: suspension and beam building. As shown in Fig. #4, the suspension method involves placing the roof bolt through seams of roof material into a layer of a stronger material and securing the bolt in that layer (expansion bolts are used most often in this method). The beam building method simply ties different seams together with roof bolts and makes each layer stronger by pulling it tightly against another.

The size, location, and style of roof bolts depends on the particular conditions of that mine. This information is detailed in the roof control plan at the mine. However, all roof bolts must be at least 30" in length and placed no more than 5 feet from the last bolt.



BOLTS ARE USED TO BIND THESE SEAMS TOGETHER IN THE SAME MANNER AS THE MANUFACTURE OF PLYWOOD.

THE ROOF BOLTS TIE THE LOWER LOWER SEAMS OF THE ROOF TO A STRONGER SEAM LOCATED ABOVE.

FIG. 4 TYPES of ROOF BOLTING

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2		STUDENT NAME	
UNIT 04	MODULE 02	TASK 050	INSTRUCTOR
DATE COMPLETED		INSTRUCTOR'S INITIALS	

TASK TITLE: *Temporary Roof Support.*

Objective:

After studying the material, the student will describe the purpose of temporary roof support by answering all review questions accurately. If required by the instructor, the student will also set temporary roof support safely and according to the instructions given in the information sheet.

Materials and Equipment:

1. One hydraulic or mechanical roof support jack
2. One cap block
3. A slate or rock bar
4. A shovel
5. A roof testing bar or hammer

Procedure:

1. Reread the objective.
2. Study the information sheet.
3. Set several temporary roof supports (if material is available)
4. Answer the Review Questions.
5. Direct any questions, about the material, to the instructor.

Review Questions:

1. How far from another roof support may a temporary support be set?

2. If the face is four feet from the last permanent support, should temporary supports be set?

3. May temporary support be used instead of permanent support?

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REVIEWED & APPROVED RESEARCH MRK INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. Wayne Farabaugh

PROGRAM D-2 UNIT NO. 04 MODULE NO. 02 TASK NO. 050

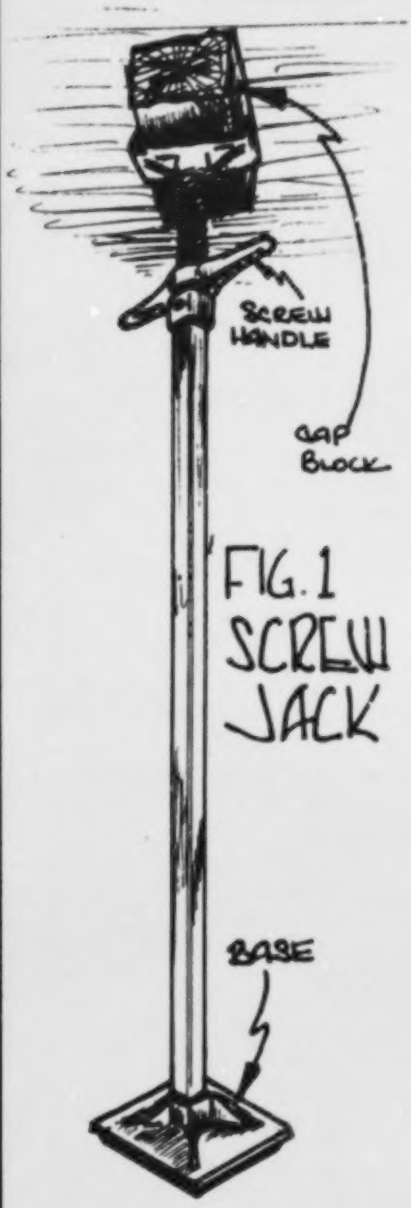

FIG. 1 SCREW JACK

INFORMATION SHEET

Temporary roof supports are used during the following situations:

1. Before and during the setting of permanent roof support.
2. When replacing or adding permanent roof support.
3. When repairing bad roof or cleaning an area after a roof fall.
4. To maintain an open work area when removing pillars or longwall mining.

A variety of supports may be used as temporary roof support. However, this support is only temporary and is not meant to replace any form of permanent roof support.

Props or posts are commonly used for temporary support, since they may be set or removed easily. Screw jacks (Fig. #1) are also common support since they may be easily adjusted for different roof heights.

An important form of hydraulic temporary roof support is chocks. (See Fig. #2) These hydraulic self-advancing roof supports are used as temporary support in a longwall mining system. However, chocks require training to operate correctly. (A separate task sheet is given for the operation, uses and designs of chocks.)

Instructions for setting temporary roof supports

1. Locate the last permanent roof support.
2. While standing under supported roof, locate the position where the temporary support must stand.
3. Visually check the roof where the temporary support must stand.
4. Using the bar, scale down all loose rock. (Scale the smaller pieces, first.)
5. Test the roof above the position for the temporary roof support.
6. If the roof is strong enough to set the temporary roof support, shovel the bottom and make the area as level as possible.
7. Set the temporary roof support. (Hydraulic or mechanical jack)
8. Place a cap block between the support and the roof.
9. Adjust the roof support until the support is snug.

The number of temporary supports in a particular area depends on the size of the area to be supported or the danger of a roof fall. (Temporary supports are never set more than five feet from another support.) However, no less than two temporary supports should be set in any area. When placing temporary supports, a systematic plan should be used to evenly distribute the weight of the roof.

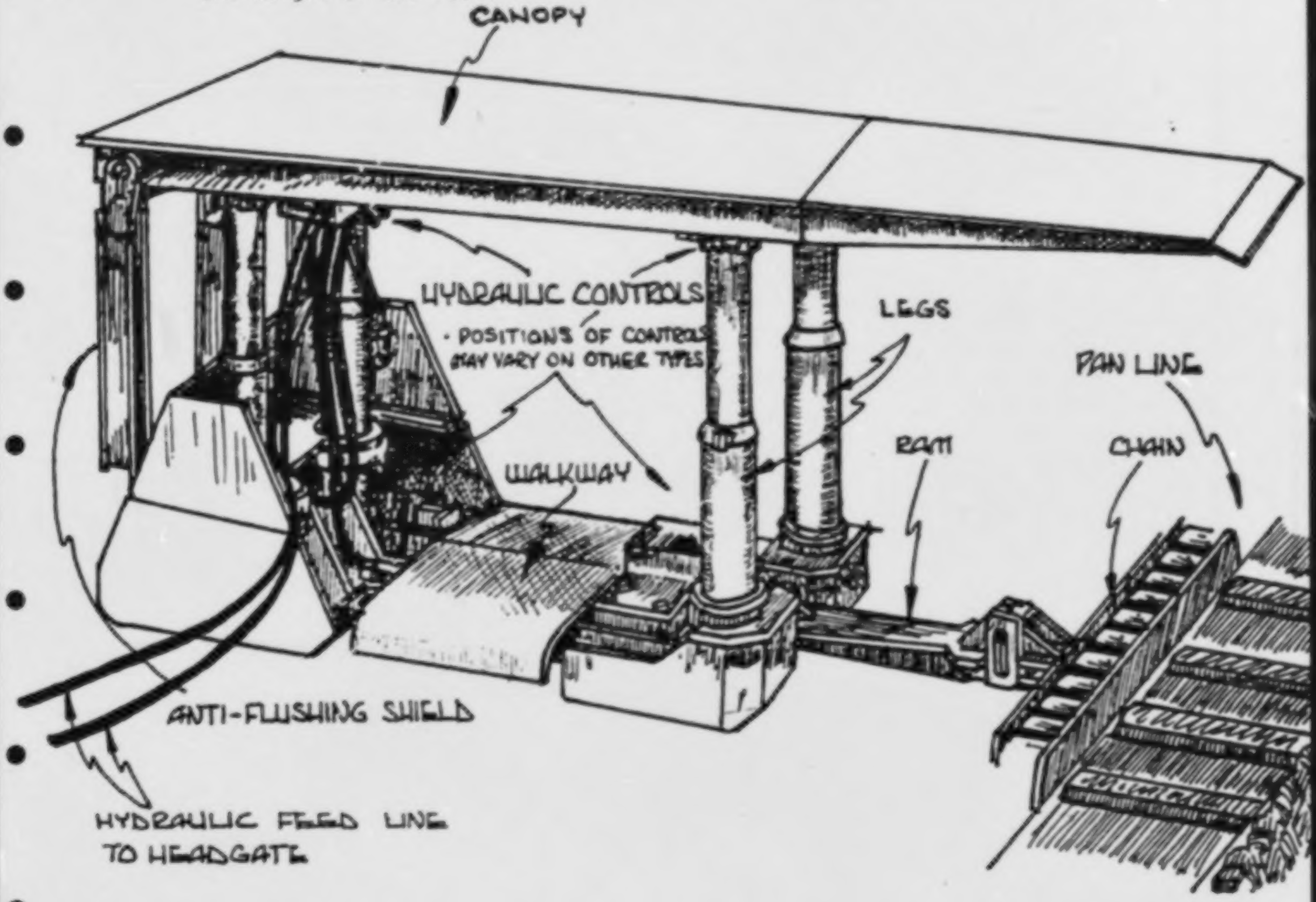
CANOPY
HYDRAULIC CONTROLS
· POSITIONS OF CONTROLS MAY VARY ON OTHER TYPES
LEGS
PAN LINE
RAM
CHAIN
WALKWAY
ANTI-FLUSHING SHIELD
HYDRAULIC FEED LINE TO HEADGATE

FIG.2 CHOCK...PAN LINE, CANOPY & OTHER COMPONENTS

No area within a mine should be left unsupported. At the end of each shift, the face area must be supported. If there is not enough time or room to set permanent roof supports, the roof area must be supported with temporary supports. (If the face is more than four feet from the last permanent support.)

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EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
STUDENT NAME
UNIT 04 MODULE 02 TASK 060
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *How to Operate Chocks (Hydraulic Powered Self Advancing Roof Supports).*

Objective:

After studying the material, the student will understand the operation and purpose of chocks to the satisfaction of the instructor by answering the review questions to 80% accuracy.

Introduction:

The use of chocks (hydraulic powered self advancing roof supports) is generally limited to mining companies using the longwall or shortwall method of operation. Workers employed by companies who do not use these mining methods may not be required to operate chocks.

Procedure:

1. Review Longwall Mining Task Sheet.
2. Study the Information Sheet.
3. Answer the Review Questions.
4. Operate the controls of a chock (if available).

Review Questions:

1. What is the headgate?

2. What equipment is located at the headgate?

3. Name three functions of the pan line?

4. What is the function of a plow?

5. Why is the roof allowed to collapse behind the chocks?

6. Why must the canopy be lowered before the chock is moved?

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REVIEWED & APPROVED
RESEARCH MSK
INSTRUCTOR
ADMINISTRATION

PREPARED BY: Mr. Bill Mulraney

7. Why must the first two chocks in a line be operated in a special manner?

8. Explain a double action jack or ram.

INFORMATION SHEET

Many different companies make hydraulic roof supports (chocks) and each brand may have a different form of control. For this reason, an exact procedure for operating chocks cannot be given since the controls on one chock may be slightly different from the controls on another. However, the general principles of chocks are the same and these will be discussed.

Figure #1 is an example of one particular chock attached to a pan line. (In longwall or shortwall operations, chocks similar to this one will be placed side by side along the entire face. The pan line will also extend along the face.)

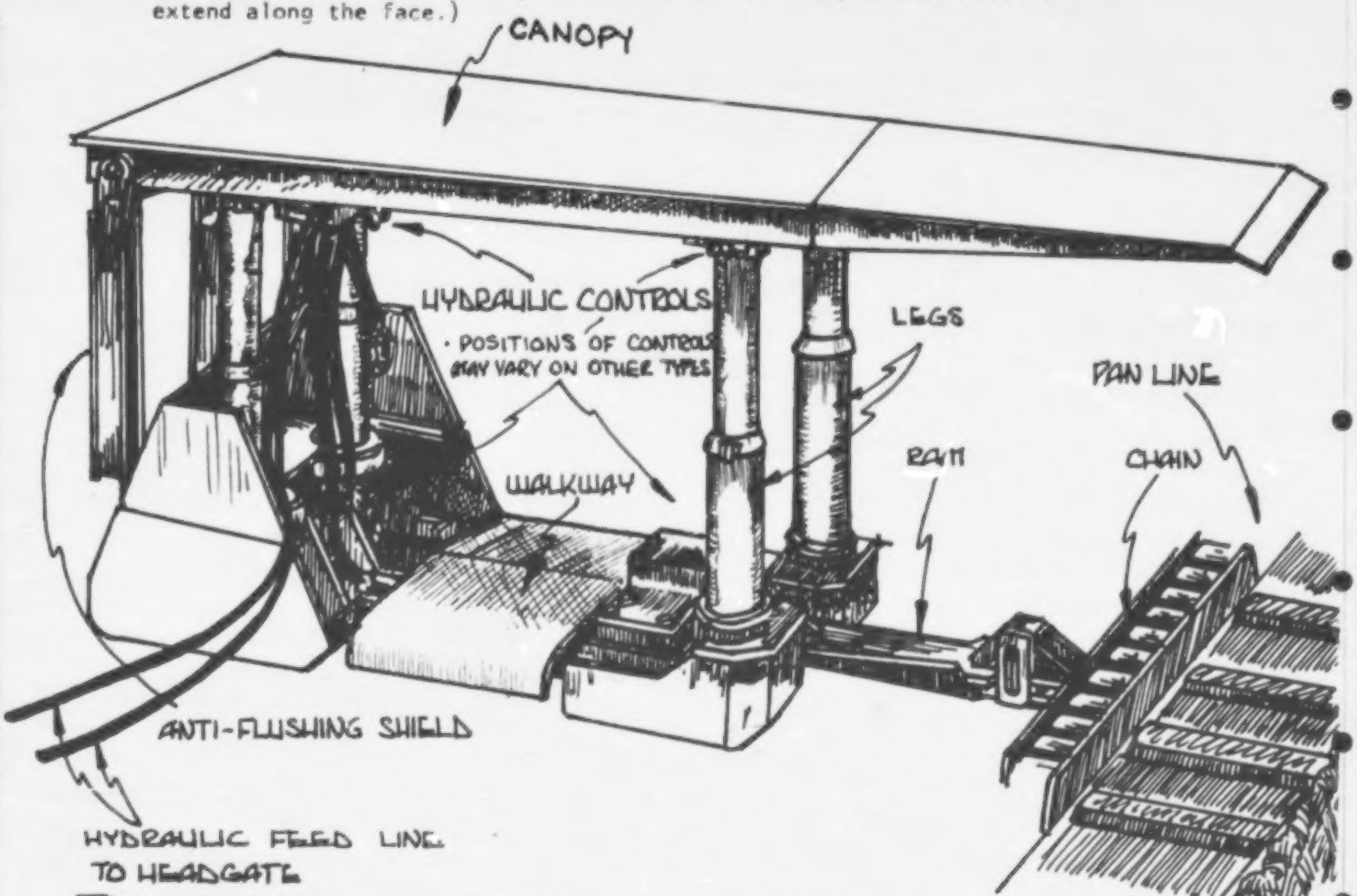

CANOPY
HYDRAULIC CONTROLS
· POSITIONS OF CONTROLS MAY VARY ON OTHER TYPES
LEGS
PAN LINE
RAM
CHAIN
WALKWAY
ANTI-FLUSHING SHIELD
HYDRAULIC FEED LINE TO HEADGATE

FIG. 1 CHOCK.. PAN LINE, CANOPY & OTHER COMPONENTS

The hydraulic controls for this chock are located directly under the canopy. In other models, the controls may be located at any of the other positions marked, or a remote control may be located somewhere away from the chock. Most controls have levers to move the chock. (Push-button models are also manufactured.) The number of levers (or push buttons) depends on the number of movable parts on the chock.

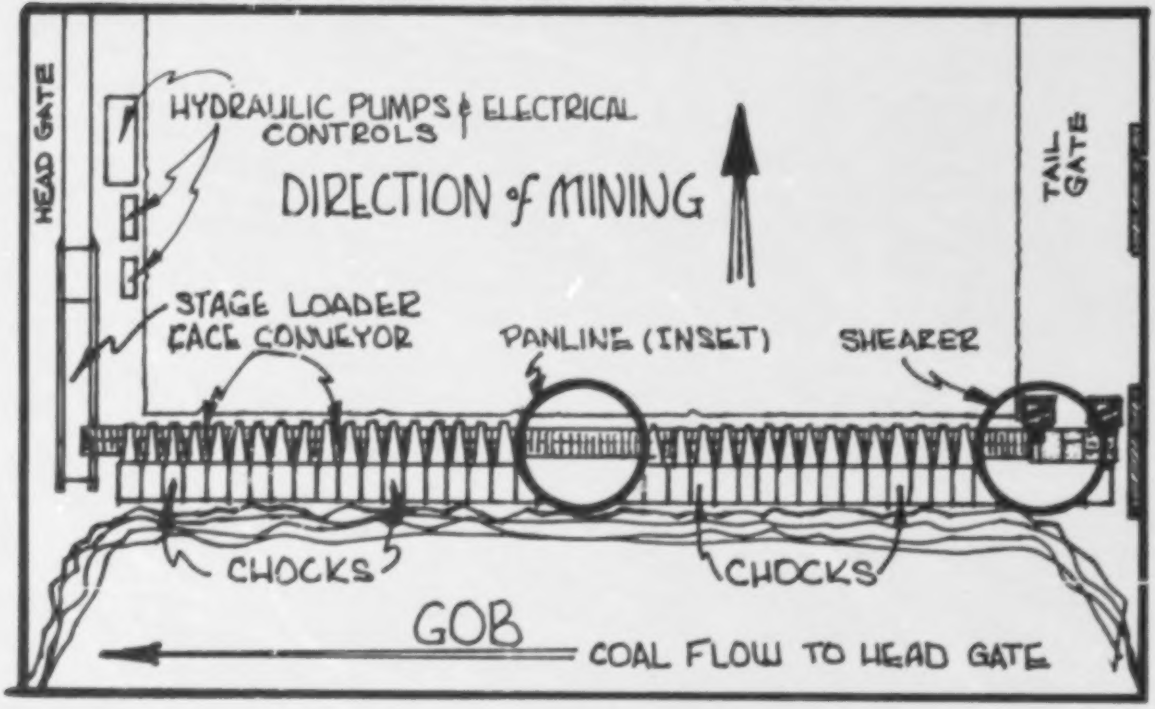
The roof is supported by a canopy which extends over the pan line and is supported on hydraulic legs that will adjust the canopy height to the height of the roof. This canopy acts as a roof over the area and all men and machinery work under it.

The pan line contains the conveyor belt, the chain drive for the shearer and acts as a track for the shearer. The pan line is made by connecting individual pans together. (Each pan weighs about 250 lbs.) At the front of the pan, there is a ram or plow which forces loose coal onto the belt. Each pan is attached to the chock by a double action jack or ram. The movement of the ram advances the chock.

Imagine the weight of a pan line, since moving this chock depends on this weight and the weight of the chock itself. As the shearer makes a cut and removes the coal, the pan line and chock line must be advanced closer to the face. Moving the pan line is the job of a "snaker" since the pan line will be moved forward a section at a time and will look like a snake. Moving chocks is the job of a "chock boy" and this worker will be responsible for several chocks. To advance this line, the worker must begin according to these instructions:

1. Study Figure #2. In this position, the shearer has finished a complete cut, the pan line has been advanced to the face, the chocks have been

FIG.2 LONGWALL MINING FACE



advanced and reset against the roof and the shearer is now ready to begin another cut.

2. After the shearer has started the cut and is well past the first few chocks, the worker may begin resetting those chocks.
3. Advance the pan line by extending the ram or jack of the first chock. (Hydraulic control)
4. Repeat the same step on the second chock. (This will hold the pan line firmly in place and allow the first chock to be pulled toward the pan line.)
5. Lower the canopy of the first chock.
6. Advance the first chock. (This may be done on some models of chocks by simply pulling the lever for advancing the ram in the opposite direction. Other models may have a separate lever or button to reverse the ram. This procedure will cause the ram to pull, rather than push. And since the second chock is holding the pan line in place, the line will not pull back to the chock, but the chock will be pulled toward the pan.)
7. After the chock is advanced to the pan line, raise the canopy of the first chock snugly against the roof.
8. Lower the canopy of the second chock, advance and reset that chock.
9. (Only the first two chocks must be advanced in this manner.) Each of the following chocks may be advanced one at a time by 1) advancing the ram, 2) lowering the canopy, 3) advancing the chock and 4) resetting the canopy.

Each chock and section of the pan line must be advanced and reset after the shearer has passed to position them for the next cut. As the chock is advanced, the roof directly behind it will collapse (to relieve the pressure on the face). To protect the worker, an anti flushing shield is set across the back of each chock to prevent rock from injuring the worker.

Obviously, each chock is important to the longwall or shortwall operation. (For roof support and moving the pan line.) If a single chock is not working properly, the entire operation must be stopped until it is repaired. A chock in the line cannot simply be replaced, because there is not enough room to move the chock to an open area. Therefore, the mechanic must repair chocks at the work site. Since longwalling or shortwalling is an expensive operation, companies have taken steps to avoid breakdowns in equipment.

In most operations, the hydraulic pumps and electric controls are located at the headgate (not in the chocks) and a hose carrying the pressurized hydraulic fluid is run from the pumps to each chock. (In this method, there are less things to break in the chock and repairs are easier.)

The task of operating chocks is usually given to the more experienced miners and there is little training necessary. Most chocks have only two or three control levers and the operation is easily learned. Chocks with more control levers (or buttons) often contain instructions for each control or a symbol that illustrates the result of moving a particular control. In a manner of a few minutes, the worker can operate all chock controls easily.

However, several important steps must be remembered when operating chocks. Advance the chock in a straight line. (Often, the chock will lean or move to the side because of roof or floor conditions.) Advance the pan line completely to the face and advance the chock as tight to the pan line as the ram will permit.

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PROGRAM D-2
STUDENT NAME
UNIT 04 MODULE 02 TASK 070
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *Speciality Roof Support.*

Objective:

After studying the material, the student will identify the types of special roof supports and the conditions that may require these roof supports by answering the review questions to 100% accuracy and to the satisfaction of the instructor.

Procedure:

1. Reread the objective.
2. Study the information sheet.
3. If the materials are available and the instructor requires, set a special roof support.
4. Answer the review questions.

Review Questions:

1. How is lagging supported?
2. Briefly describe roof bolts mats.
3. Explain how the yieldable steel arches change for greater pressure.
4. How is the concrete mixture used for lining applied?
5. What are roof trusses?
6. What type of roof support is generally used on main intersections?
7. Why would lapping be used over main intersections?

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REVIEWED & APPROVED RESEARCH MSK INSTRUCTOR ADMINISTRATION JMB

PREPARED BY: Mr. Wayne Farabaugh

INFORMATION SHEET

Many different types of special roof support are used within a mine. These roof supports are not classified as being either conventional or roof bolting but may be used in addition to either method of roof support.

Lagging - (Fig. #1)
This method of roof support is used in sections of soft roof where small loose rock is likely to fall. To prevent this rock from falling a system of planks (like floor boards) is placed against the roof. The planks are fitted tightly together and supported against the roof by crossbars or steel arches. After being completed the lagging will hold all small rocks in place.

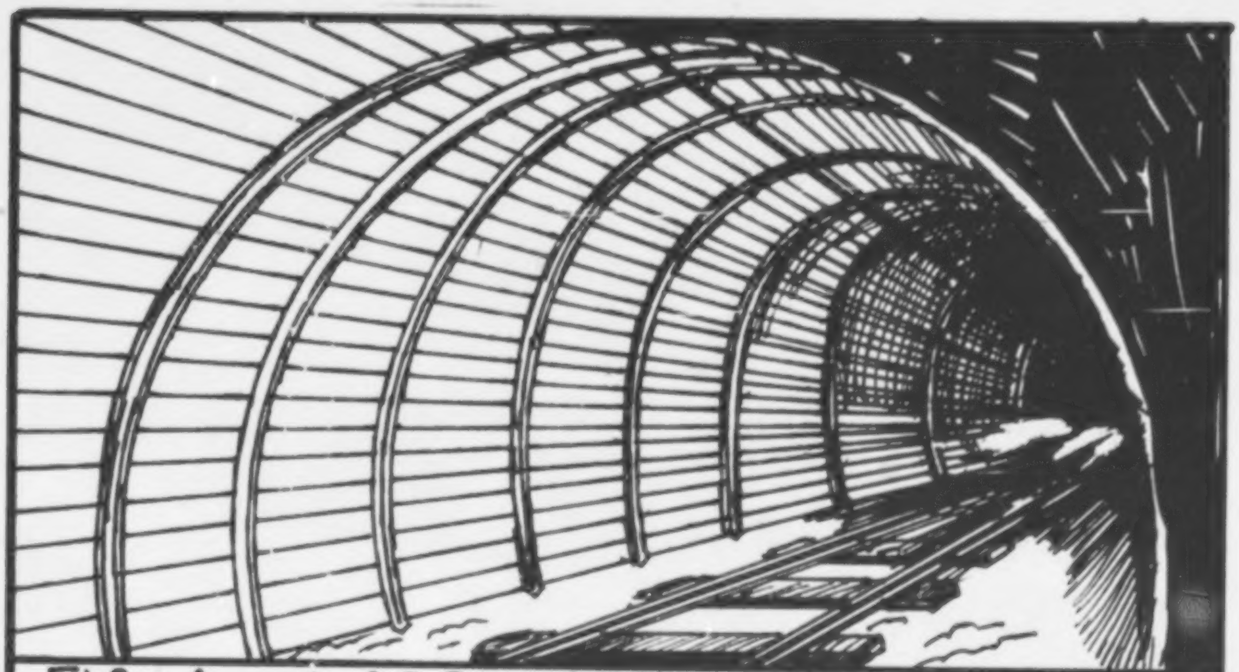

FIG. 1 LAGGING WITH STEEL ARCHES

Roof Bolt mats ("Bacon skins") (Fig. #2)
This method is also used in sections of soft roof. However, bacon skins are only used by mines that have roof bolting equipment. The mats are placed against the roof and may be formed to fit the shape of the particular section. (Since the mats are fairly thin, a hammer may be used for shaping.) The mats are then bolted into place, using the holes provided. Roof Bolt Mats are often used in sections, following a roof fall to support the uneven roof that is left.

Steel Arches - (Fig. #3)
In many mines, yieldable steel arches are used as the basic type of roof support. (Arches are rarely used in coal mines, unless a particular mine is extremely deep and the overburden is heavy.) Steel arches have two basic advantages: 1) the arches can support much weight and as the

pressure increases the arches will collapse slowly and always keep the entry open. 2) If lagging is constructed above the arches, clean-up of fallen rock is limited.

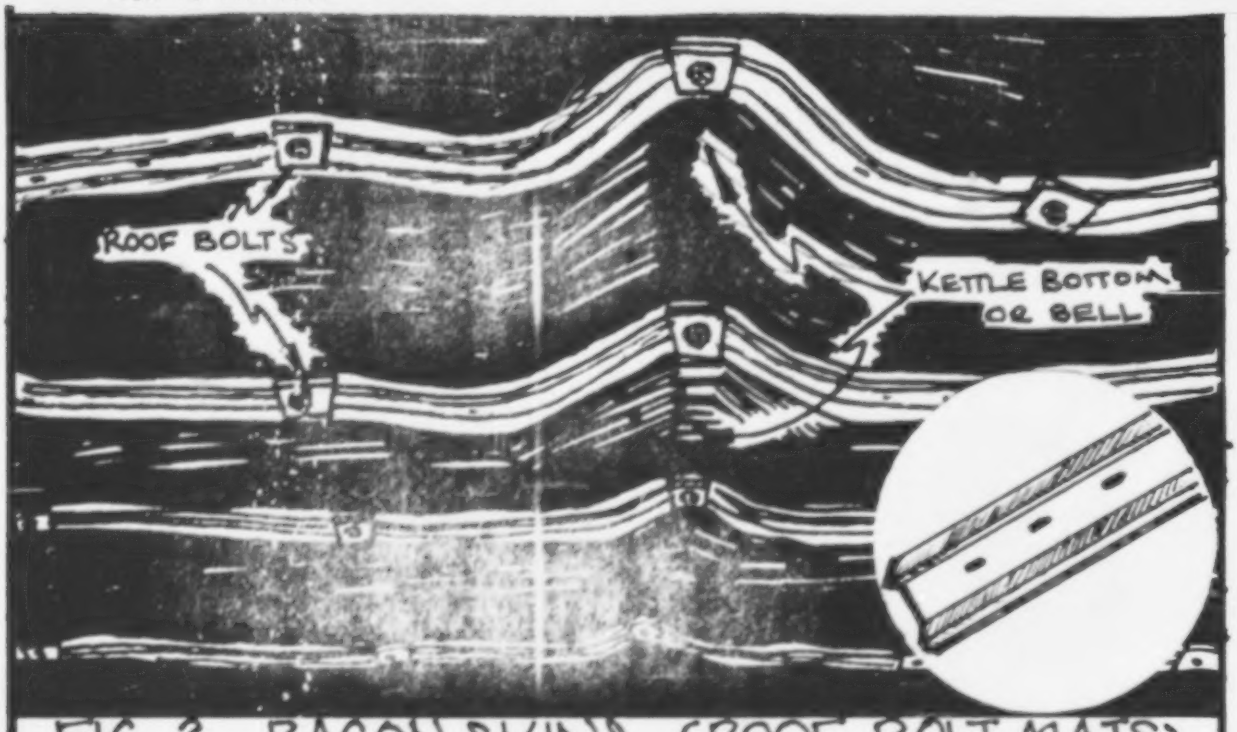
ROOF BOLTS
KETTLE BOTTOM OR BELL

FIG. 2 BACON SKINS (ROOF BOLT MATS)

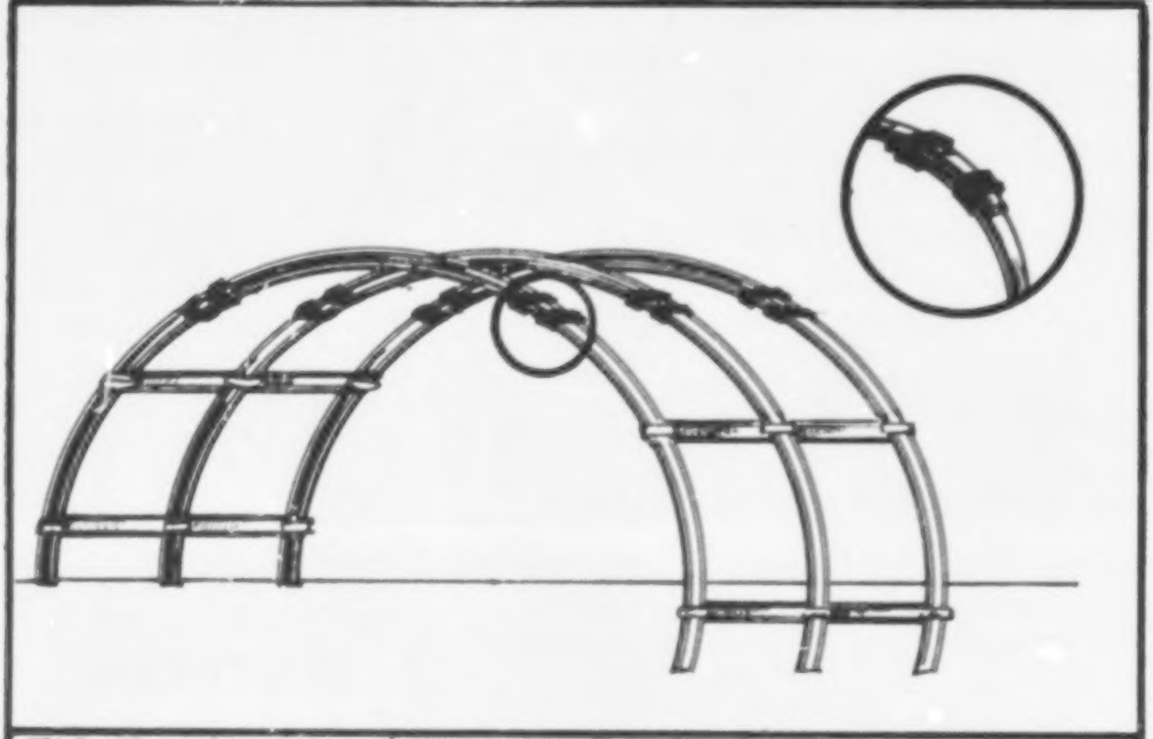

FIG. 3 A YIELDABLE STEEL ARCH

Roof Trusses (Fig. #4)
In mines using the roof bolting method of support, roof Trusses are often used in main haulageways for additional support. Trusses are simply made by inserting roof bolts at angles into the corners formed by the meeting of the roof and ribs. (See fig. #4) Often, these trusses are joined by a cable and two turnbuckles, to pull the trusses tightly toward the center of the entry and give additional support to the roof and rib.

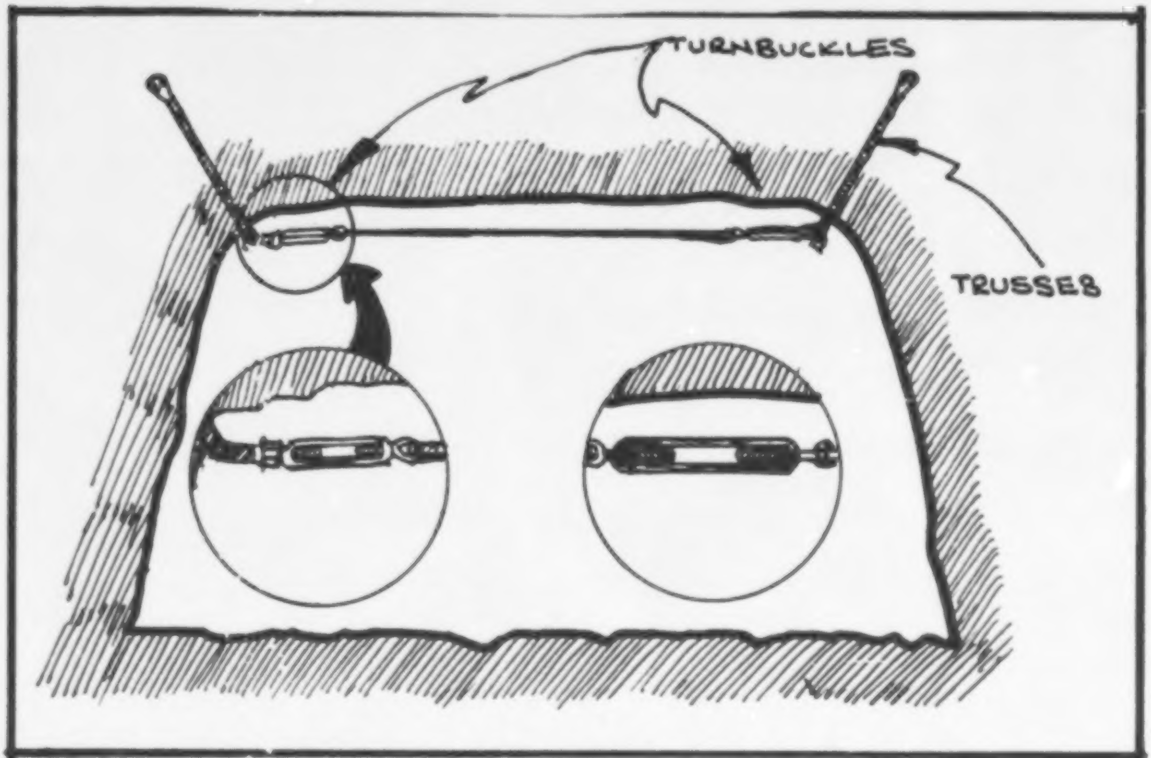

FIG. 4 ROOF TRUSSES AND TURNBUCKLES

Lining
Mine water causes damage to the roof support and entry. Often this water will filter down from the overburden and weaken the roof or rib.

A waterproof sealant is often applied to the roof and ribs to "seal out" this water. This sealant may be coal tar or a mixture of sand, water and cement.

Certain forms of roof material will "flake" when exposed to the air for a short length of time. These linings of sealants will prevent damage by mine water and moist air by forming a thin layer of waterproof material on the roof and ribs.

Coal tar is usually applied with brushes, but the concrete mixture is applied wet with air pressure machines (like rock dusting equipment).

Concrete or block walls - (Fig. #5)
Certain sections of every mine have extreme pressure on them, constantly. (intersections, switchout, etc.) These sections are usually supported by poured concrete and cement block structures. This method of support is strong and will last many years without repair.

These structures are designed, made and maintained by skilled masons. The basic design often includes crossbars and lagging for additional support.

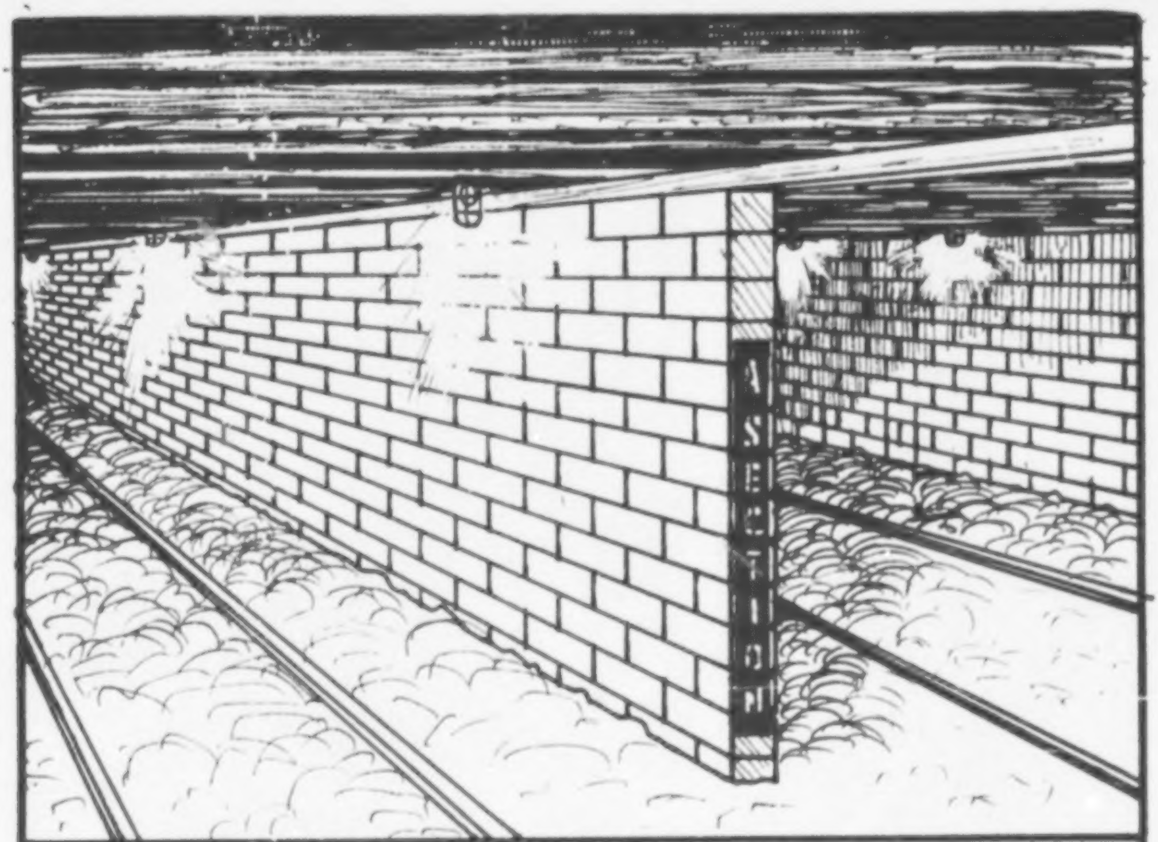

FIG.5 USING BLOCKS, CROSSBARS & LAGGING AT MAIN INTERSECTIONS.

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EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
UNIT 04 MODULE 03 TASK 010
DATE COMPLETED

STUDENT NAME
INSTRUCTOR
INSTRUCTOR'S INITIALS

TASK TITLE: *Roof Support Plans.*

Objective:

After studying the material, the student will understand a typical roof support plan to the satisfaction of the instructor by answering the review questions to 80% accuracy.

Introduction:

Federal Law 75.200 requires each company submit a detailed plan for roof support to the district manager of the Coal Mine Health and Safety District. Among other information, this plan must include the type of permanent and temporary roof support used, its location and specifications. This same information will be available to every worker in the company, to aid the worker when setting roof supports. This task sheet will discuss several typical roof support plans. However, each worker should understand the roof support plan in his own mine, follow it accurately and help correct any mistakes in roof support when working underground.

Procedure:

1. Reread the introduction.
2. Study the information sheet.
3. Examine the illustrations.
4. Answer the review questions.

Review Questions:

1. Who designs roof support plans?

2. Who must approve these plans?

3. What information must be included in roof control plans?

4. Where are complete roof control plans located?

5. May additional roof support be used without changing the roof support plans?

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REVIEWED & APPROVED
RESEARCH MSK INSTRUCTOR ADMINISTRATION JMB
PREPARED BY: Mr. Wayne Farabaugh

PROGRAM D-2 UNIT NO. 04 MODULE NO. 03 TASK NO. 010

INFORMATION SHEET

Roof support plans are designed and maintained by the mining company. The details of each plan are important to mine foreman and supervisors. However, the general information included in the plan should be understood by every worker.

This general information is usually located on the first page of the roof control plan and includes: 1) the type of support used in the mine, 2) the sections covered by the plan and 3) an illustration of the strata. With this information, a worker should know the roof support details of his section, what to expect at the work site, and have the ability to recognize bad roof, poor timbering or other unsafe conditions.

Figure #1 is a typical illustration included in a complete roof control plan. This particular plan involves the conventional method of roof support (timbering). Each diagram includes the distance between props and all information related to the setting of those props.

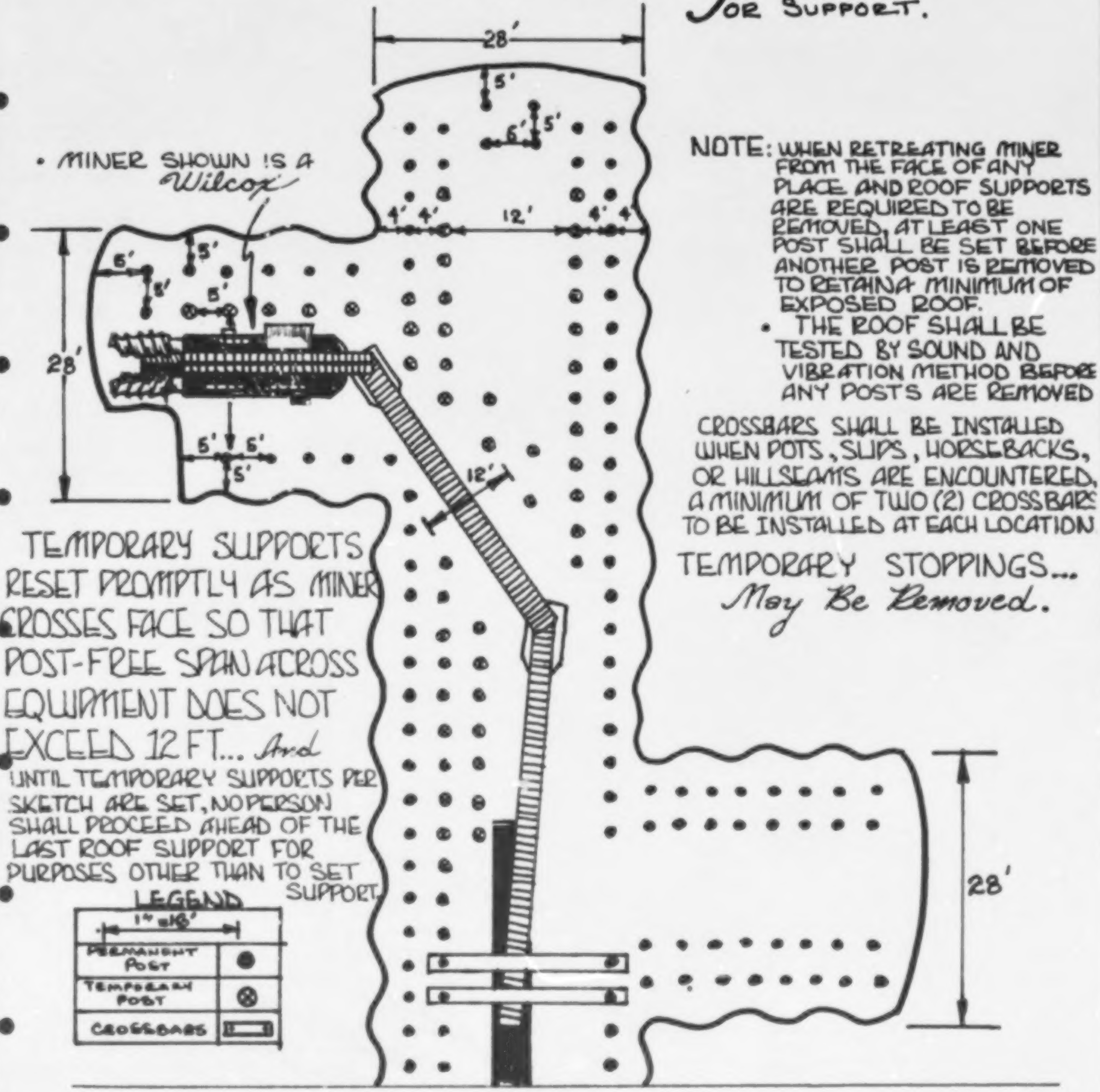
Figure #2 provides all the necessary information about roof bolting a particular section. The type, size and style or roof bolts to be used is also included in the roof control plan.

However, in most mines, a combination of roof support methods is used. Figure #3 is a complete roof support diagram for a particular section near the face. All the details of support should be included in the diagram.

Other methods of roof support will be illustrated within a roof control plan at a particular mine. Workers should carefully study these plans before going underground. (These plans are usually displayed in several buildings outside the mine.) These roof support plans are submitted to the district manager before the mine is opened. Once the plans have been approved by the government, the operator may begin mining. These plans only show the minimum roof support. If necessary in a particular section, additional roof support may be added to the support that is designed in the roof support plan.

If an operator chooses to change the method of roof support in that particular mine, the operator must: 1) Notify the district manager of the proposed change. 2) Test the new method in a particular section for an amount of time that will be decided by the district manager. 3) Submit a new roof control plan to the district manager.

FIG.1 ROOF SUPPORT PLAN USING PROPS *for Support.*



• MINER SHOWN IS A *Wilcox*

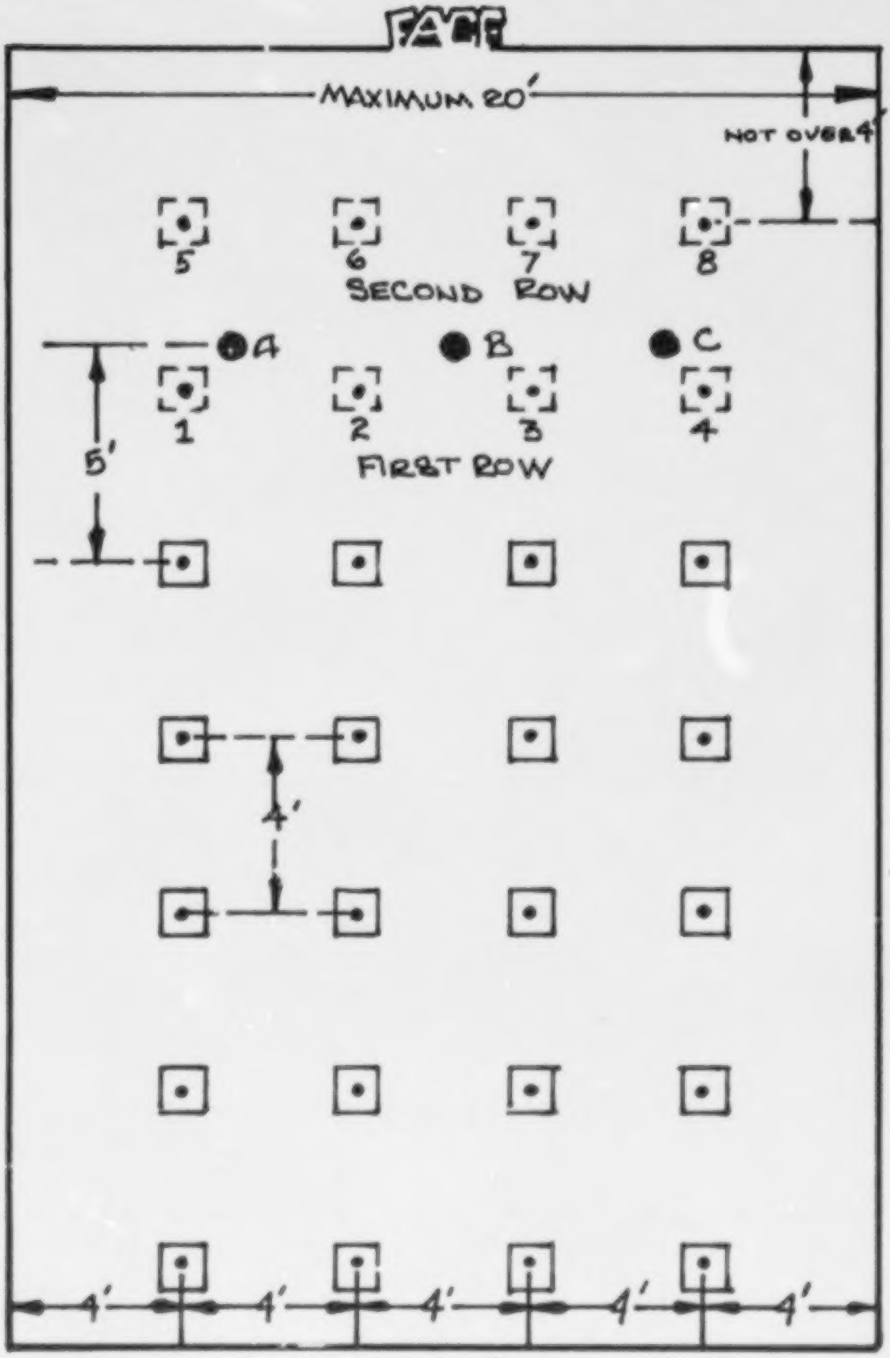
NOTE: WHEN RETREATING MINER FROM THE FACE OF ANY PLACE AND ROOF SUPPORTS ARE REQUIRED TO BE REMOVED, AT LEAST ONE POST SHALL BE SET BEFORE ANOTHER POST IS REMOVED TO RETAIN A MINIMUM OF EXPOSED ROOF.

- THE ROOF SHALL BE TESTED BY SOUND AND VIBRATION METHOD BEFORE ANY POSTS ARE REMOVED

CROSSBARS SHALL BE INSTALLED WHEN POTS, SLIPS, HORSEBACKS, OR HILLSEAMS ARE ENCOUNTERED. A MINIMUM OF TWO (2) CROSSBARS TO BE INSTALLED AT EACH LOCATION

TEMPORARY STOPPINGS... *May Be Removed.*

TEMPORARY SUPPORTS RESET PROMPTLY AS MINER CROSSES FACE SO THAT POST-FREE SPAN ACROSS EQUIPMENT DOES NOT EXCEED 12 FT... *And* UNTIL TEMPORARY SUPPORTS PER SKETCH ARE SET, NO PERSON SHALL PROCEED AHEAD OF THE LAST ROOF SUPPORT FOR PURPOSES OTHER THAN TO SET SUPPORT.


FACE
MAXIMUM 20'
NOT OVER 4'
5
6
7
8
SECOND ROW
A
B
C
1
2
3
4
FIRST ROW
5'
4'
4'
4'
4'
4'
4'

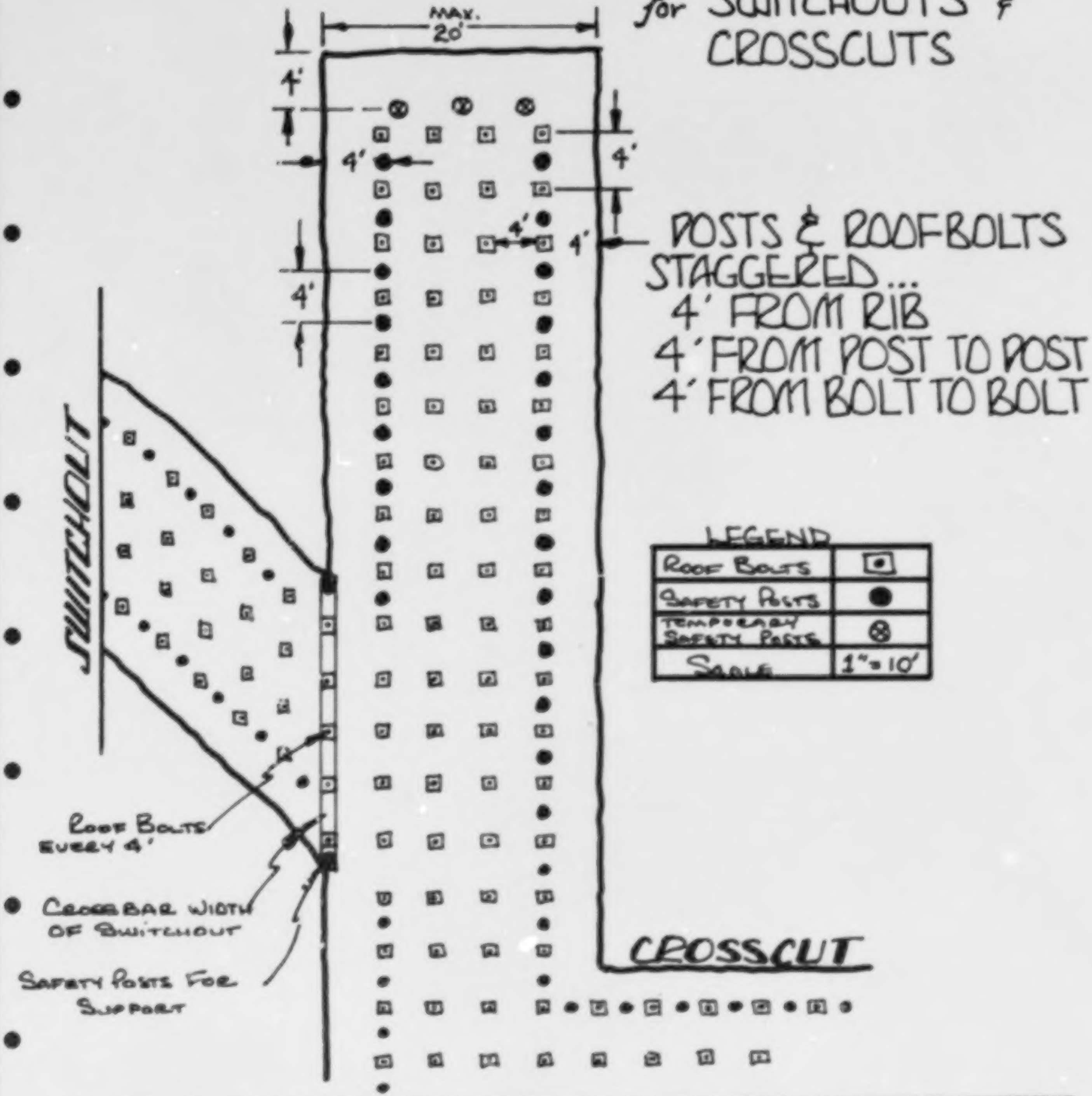
LEGEND

ROOF BOLT	⊡
ROOF BOLT TO BE INSTALLED	⊡
SAFETY POST	●
SCALE	1'=4'

SAFETY POSTS SHALL BE SET AS SHOWN BEFORE ROOF BOLTING IS STARTED. AFTER THE FIRST ROW IS INSTALLED THE SAFETY POSTS SHALL BE MOVED UP AND SET IN THE CORRESPONDING LOCATION IN THE SECOND ROW BEFORE THESE BOLTS ARE INSTALLED.

FIG. 2 EXAMPLE of a ROOF SUPPORT PLAN for a ROOM USING ROOF BOLTS AS SUPPORTS

FIG. 3 EXAMPLE of ROOF SUPPORT SYSTEM for SWITCHOUTS & CROSSCUTS


MAX. 20'
4'
4'
4'
4'
4'
4'
4'
SWITCHOUT
CROSSCUT
Roof Bolts every 4'
Crossbar width of Switchout
Safety Posts for Support

POSTS & ROOFBOLTS STAGGERED...
4' FROM RIB
4' FROM POST TO POST
4' FROM BOLT TO BOLT

LEGEND

Roof Bolts	⊡
Safety Posts	●
Temporary Safety Posts	⊗
Scale	1" = 10'

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2 STUDENT NAME __________

UNIT 04 MODULE 03 TASK 020 INSTRUCTOR __________

DATE COMPLETED __________ INSTRUCTOR'S INITIALS __________

TASK TITLE: *Timbering Plan for a Pillar Section.*

Objective:

After studying the material, the student will explain the basic principles of timbering in a pillar recovery section to the satisfaction of the instructor, by answering the review questions to 100% accuracy.

Introduction:

Federal Law (75.200-11) requires that timbering be used in all pillaring sections. (Even mines that use roof bolting, must use posts or props when pillaring.) For this reason, this task sheet will give an example of a timbering plan used in many pillar recovery sections.

Procedure:

1. Reread the Objective.
2. Study the Information Sheet and Illustrations.
3. Direct any questions, about the material, to the instructor.
4. Answer all Review Questions.

Review Questions:

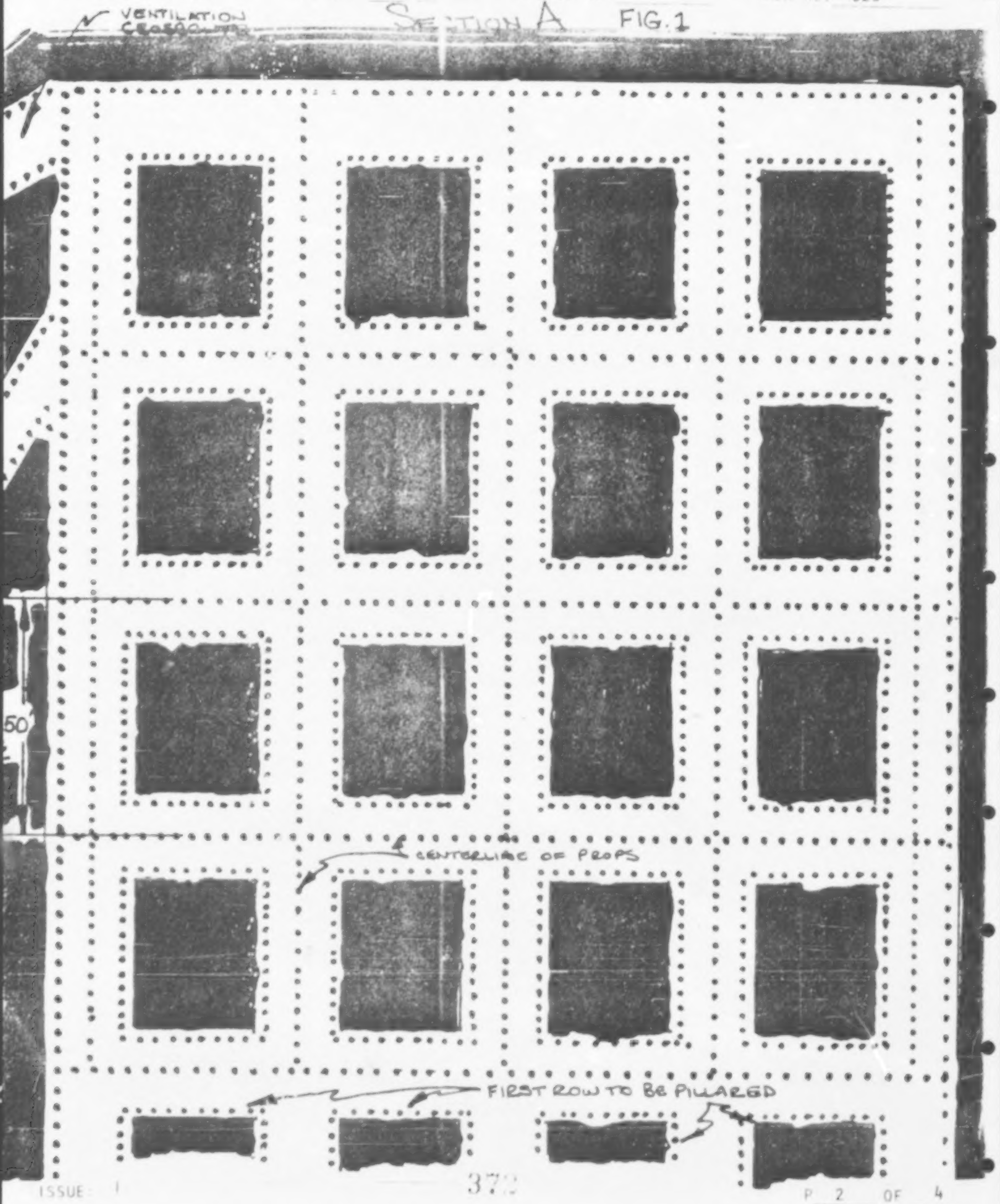
1. What is a fracture line?
2. After the first cut has split the pillar, where should the supports (props) be placed?
3. For what purpose is a "curve" used?
4. Who may retrieve timbers in a pillar section, so that they may be used again?

ISSUE 1 DATE 6/7/77 P 1 OF 4

REVIEWED & APPROVED RESEARCH M&K INSTRUCTOR __________ ADMINISTRATION JMS

PREPARED BY: Mr. L. Thomas Gailey

SECTION A FIG.1


VENTILATION CROSSCUTS
50
℄ CENTERLINE OF PROPS
FIRST ROW TO BE PILLARED

PROGRAM D-2 UNIT NO. 04 MODULE NO. 03 TASK NO. 020

INFORMATION SHEET

Before pulling any pillars, a large amount of timbering must be completed. All line rooms in a section must be well supported to keep the section and airway open.

The timbering of these rooms is fairly simple. (In fact, if timbering is the standard method of roof support in the mine, most of the work is already done.) Props are set four feet from each rib and four feet from the next prop (Standard entry timbering) on all entries. All entries, beyond the starting point for pillaring, are also timbered with a center line of props. (Also set at four feet centers.) Once pillaring has begun, these entries will not be used to move equipment.

As shown in fig. #1, the section between the pillaring area and the boundary line is almost completely filled with props. This section is supported to prevent the process of pillaring from collapsing the airway.

All other timbering (except the standard roof support) done in the section to be pillared, is completed by timbering one pillar area, removing the pillar and timbering the next pillar.

As shown in Fig. #2, a breaker row (two rows of four props) and a curve are set. The breaker row is set to form a fracture line. (line where the roof collapse is meant to stop.) The continuous miner will split the pillar and props are set against each newly formed rib.

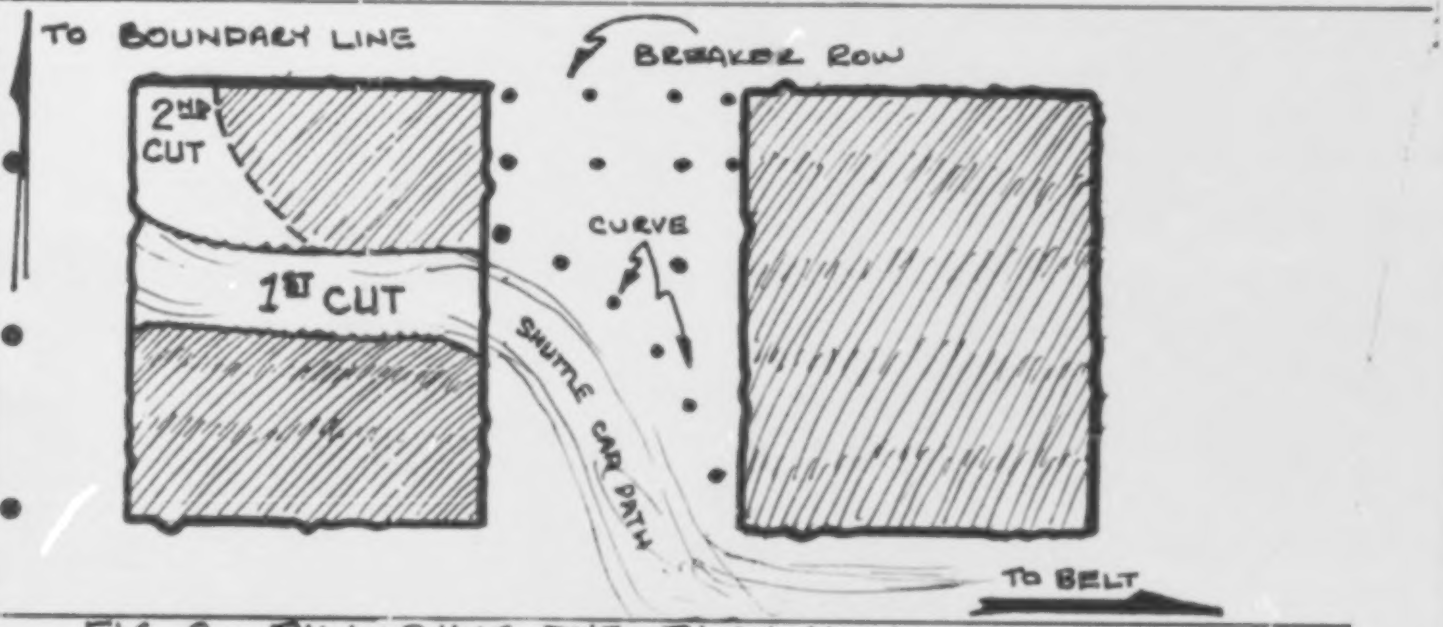


FIG. 2 PILLARING THE BACK HALF OF PILLAR

The miner will retreat and make cut #2. (Props are again set against each new rib.)

PROGRAM D-2 UNIT NO. 04 MODULE NO. 03 TASK NO. 020

After the rear half of the pillar has been removed, two new breaker rows are constructed. (As shown in Fig. #3.) A curve is also placed as shown and the miner may begin removing the second half of the pillar immediately. After most of the pillar has been removed, the pressure may begin snapping the props and the roof will begin to collapse. It may be impossible to remove all of the pillar. (In some cases, several pillars may be removed before the roof begins to collapse.)

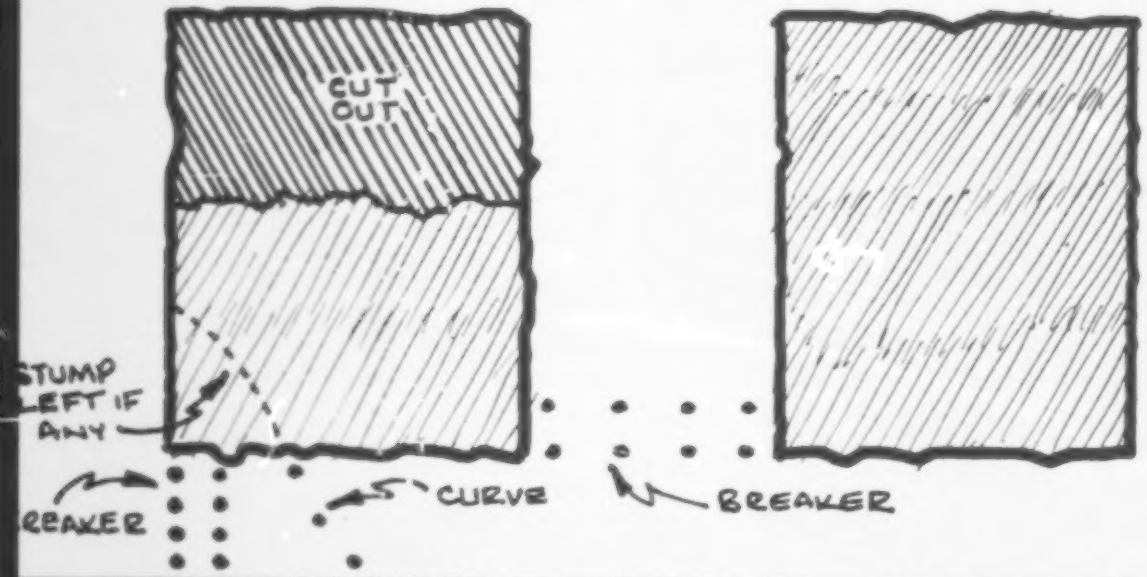


FIG.3 PILLARING THE FRONT HALF OF PILLAR

It is impossible to remove timbers after the pillar of coal is removed. It is far too dangerous for any worker to re-enter a pillar section after the major roof support (the coal pillar) has been removed. At all times, it is important for all workers in a pillar section, to continuously check the roof condition and report any unsafe conditions to the face foreman.

Retreat work, if properly planned and practiced, can produce a large quantity of coal in a short time. However, pillaring is still very hazardous work.

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2 STUDENT NAME

UNIT 05 MODULE 01 TASK 010 INSTRUCTOR

DATE COMPLETED INSTRUCTOR'S INITIALS

TASK TITLE: *Visual Mine Communication.*

Objective:

After studying the information sheet, the student will explain the various types of visual mine communication by answering the review questions to 90% accuracy.

Introduction:

Past experience has proved the value of good communications in the smooth operation of a mine. Good mine communications are in the event of an emergency to transmit instructions, relay reports on conditions and relay advice in rescue and recovery operations.

Because of the size, noise and activity involved in the operation of a coal mine, it is necessary to rely on many forms of communication, mainly visual (sight), verbal (speech), audio (sound), and olfactory (smell).

Procedure:

1. Read the objective several times.
2. Read the introduction.
3. Study the information sheet.
4. Answer all review questions.

Review Questions:

1. Briefly explain what a danger sign is and what its used for.

2. What does a red light at a runaway switch indicate?

3. What does a red light at a unloading station indicate?

4. Explain the three common signals when using a cap lamp.

ISSUE 1 DATE 6/16/77 P 1 OF 2

REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. L. Thomas Gailey

5. Where and what is a closed circuit used for in the mines?

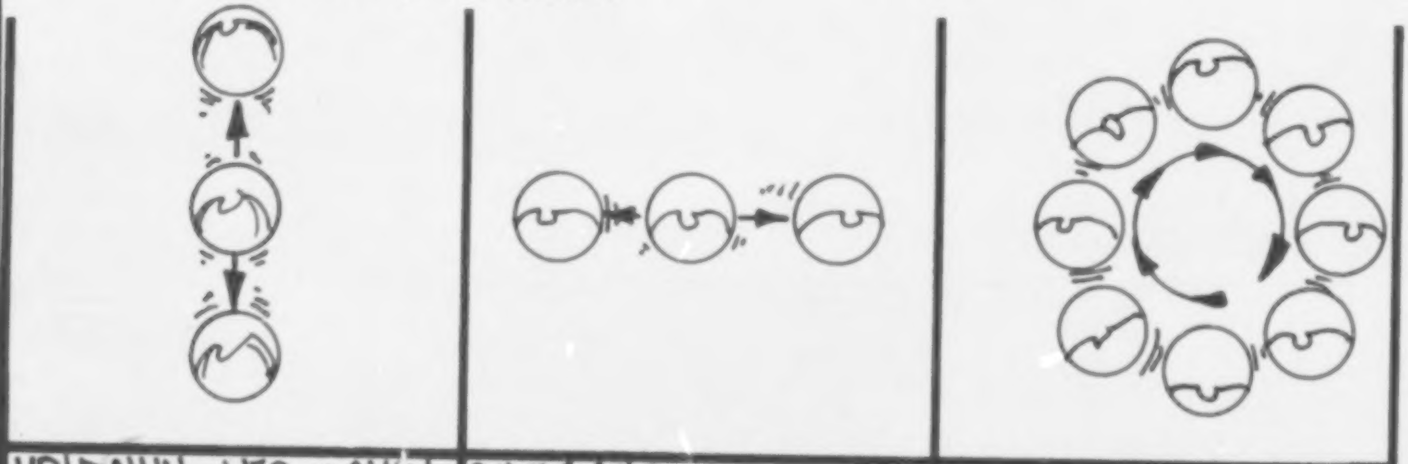
INFORMATION SHEET

Probably the most reliable form of communication in the mine is visual. Danger boards and signs, most of which are self explanatory, are posted inside and outside the mine. Danger boards, such as "HIGH VOLTAGE", "NO CLEARANCE" and DANGER AREA", warn miners of hazardous conditions. Signs, such as "MEN WORKING ON BELTS" and "DO NOT RIDE BELTS", aid in preventing accidents and signs, such as "ESCAPE WAYS" and "EMERGENCY WATER CARTS" aid in case of accidents. Reflectors and florescent tape point out low hanging roof.

Blinking lights are used to indicate circuits throughout the mine. On uphill grades, at least every 500', are runaway switches which will derail runaway equipment and force them into gob areas. A red light indicates a rerailed runaway. A green or blue light means the switch is closed and the go-ahead is good. Those mines that permit miners to ride the conveyor belts use a red light at the last unloading station to warn the miners that beyond that point is unsafe to ride. A blinking red light across from the lampman's office alerts miners that an accident has occurred that day.

The use of the cap lamp is a common method of signaling. An up and down movement of the head means "yes" or "okay to move ahead". A side to side movement means "no" or "stop". A circular motion with the head means "come along" or "okav to keep moving". See Fig. #1.

The newest addition to visual mine communication is the closed circuit T.V. system. The dispatcher can now watch the head and tail pieces on the belt line from his station.



UP&DOWN = YES OR OKAY | SIDE TO SIDE = NO OR STOP | CIRCULAR = COME ALONG

FIG. 1 USE OF CAP LAMP FOR VISUAL MINE COMMUNICATION

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EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2

STUDENT NAME

UNIT 05 MODULE 01 TASK 020

INSTRUCTOR

DATE COMPLETED

INSTRUCTOR'S INITIALS

TASK TITLE: *Verbal Mine Communication.*

Objective:
After studying the information sheet, the student will explain the various types of verbal mine communication by answering the review questions to 90% accuracy.

Procedure:
1. Read the objective at least twice.
2. Study the information sheet.
3. Answer all review questions.

Review Questions:
1. Briefly list all general locations where telephones or a equivalent two-way communication system is required by federal law.
2. What type of verbal communication is used by rail equipment operators? Why?
3. What type of verbal communication is commonly used outside the mine?

ISSUE 1

DATE 6/15/77

P 1 OF 2

REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. L. Thomas Gailey

PROGRAM D-2 UNIT NO. 05 MODULE NO. 01 TASK NO. 020

INFORMATION SHEET

According to federal law 75.1600, a telephone service or equivalent two-way communication facility must be provided between the surface and each landing of main shafts and slopes and between the surface and each working section that is more than 100 feet from a portal. A telephone or equivalent two-way communication system must be located on the surface within 500 feet of all main portals where someone on duty can respond immediately. At least one such facility must be located underground where someone on duty can respond. Federal law also requires a telephone or two-way facility at each working section located not more than 500 feet outby the last open crosscut and not more than 800 feet from the farthest point of the working section. These communication systems must be able to operate in the event of a electric power failure. Any failure in the system must be repaired at once because, besides keeping the activity of the mine in smooth operation, the system is a valuable aid in the case of an emergency.

Two-way radios are used between the dispatcher and rail equipment operator. Two-way radios are necessary because rail equipment must remain mobile and can not be wired to a stationary point.

C-B radios (citizen's band), operated on a special frequency by FCC, are widely used outside the mine.

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PROGRAM D-2

STUDENT NAME

UNIT 05 MODULE 01 TASK 030

INSTRUCTOR

DATE COMPLETED

INSTRUCTOR'S INITIALS

TASK TITLE: *Operation and Location of Pager Systems.*

Objective:
After the class demonstration and studying the information sheet, the student will operate at least one available pager system following the instructions on the pager box to the satisfaction of the instructor.

Reference:
Class discussion and demonstration.

Tools and Material:
At least one current paging system commonly used in this locale.

Procedure:

1. Read the objective several times.
2. Study the information sheet and illustrations.
3. Following the instructions on the pager box, operate at least one available paging system to the satisfaction of the instructor.

ISSUE 1

DATE 5/6/77

P 1 OF 4

REVIEWED & APPROVED

RESEARCH

INSTRUCTOR

ADMINISTRATION

PREPARED BY: Mr. Bill Mulraney

PROGRAM D-2 UNIT NO. 05 MODULE NO. 01 TASK NO. 030

INFORMATION SHEET

The only form of communication that connects the outside and the inside mine is the telephone pager system. Because of the many uses for a telephone communication system throughout a mine, such as signaling, emergencies and ordering supplies, it is important to only use the phones when necessary. Most phone systems have directions on the pager box. Although the phones can be located anywhere, among the most common locations are the mine foreman's office, lamphouse, mechanics shanty, each belt drive (main and butt head belt drives) tail piece of each working area and the first aid station at each section.

One popular type of mine phone used in the mine today is the Femco.

Operation of the Femco

To place a call:

1. Pick up receiver from hook.
2. Press the button located on the receiver and hold. (This button switches the phones on and off.)
3. Press the button located on the front of the box and hold. (This button switches the loudspeakers throughout the mine.)
4. "Page" in a clear, normal voice until the call is acknowledged.
5. Once the call is answered, release the button on the box to cut off the loudspeakers and create a private line.
6. When speaking, press the button on the phone and hold.
7. When listening, release the button on the phone.

To answer a call:

1. Pick up receiver from hook.
2. Press the button on the phone, hold and speak.
3. When listening, release the button on the phone.

Another very popular type of phone system used in todays mines is the MSA Permissible Pager.

The MSA can be used anywhere inside or outside the mines. During the moving of Longwall equipment, MSA pagers are hung about 150' apart on chocks along the haulage way for direct communication between the mine foreman's office and the working party. The MSA is often used to signal the beginning of operation by announcing "Clear the panline".

Operation of the MSA

To place a call:

1. Pick up receiver from hook.
2. Press the button on the front of the box and hold.
3. In a clear, normal voice, "page" until the call is acknowledged.
4. Release the button and use as an ordinary telephone.

To answer a call:

1. Pick up receiver from hook.
2. Use as an ordinary telephone.

FIG.1 AUDIO/PAGE COMMUNICATION UNIT

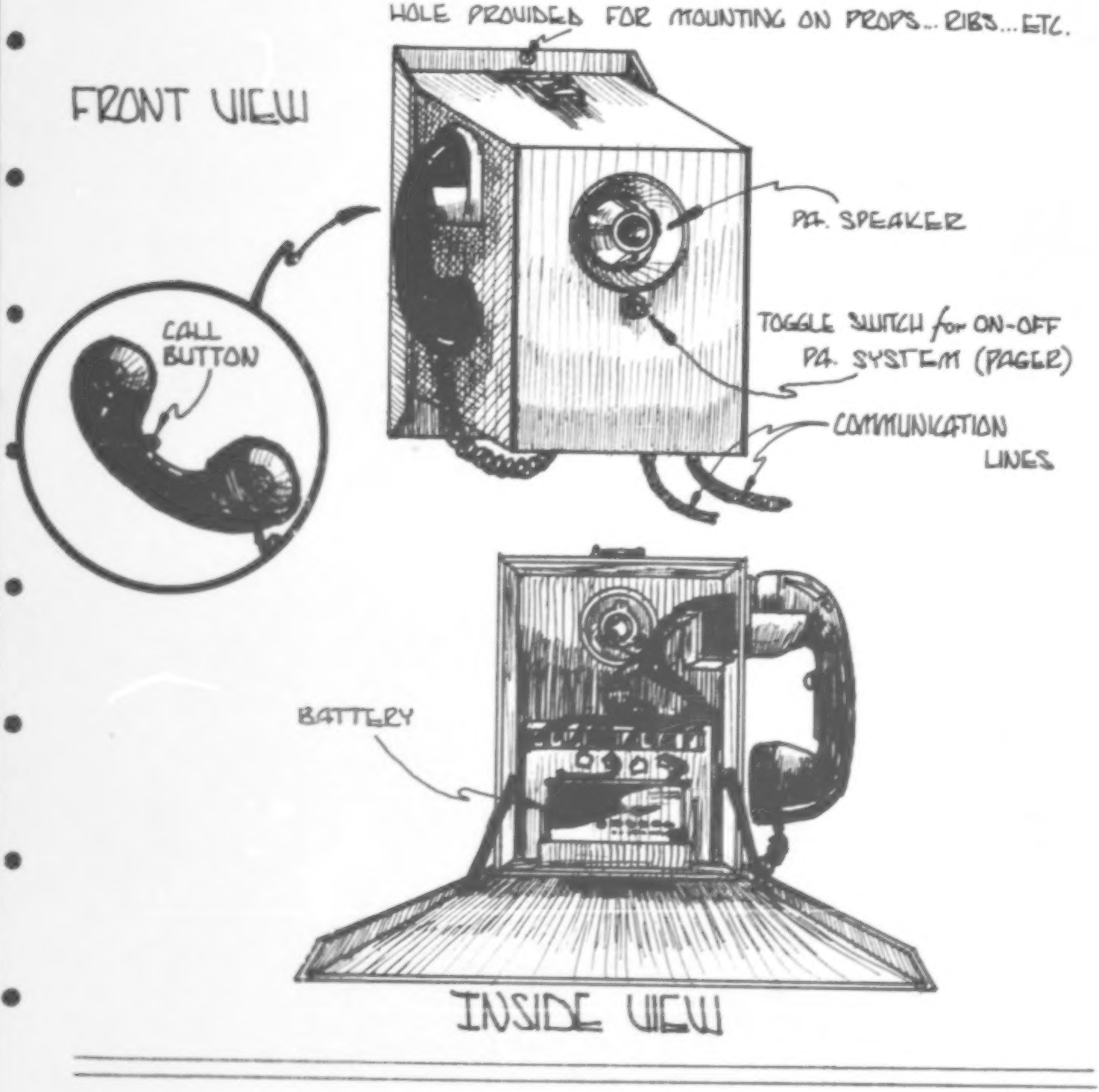
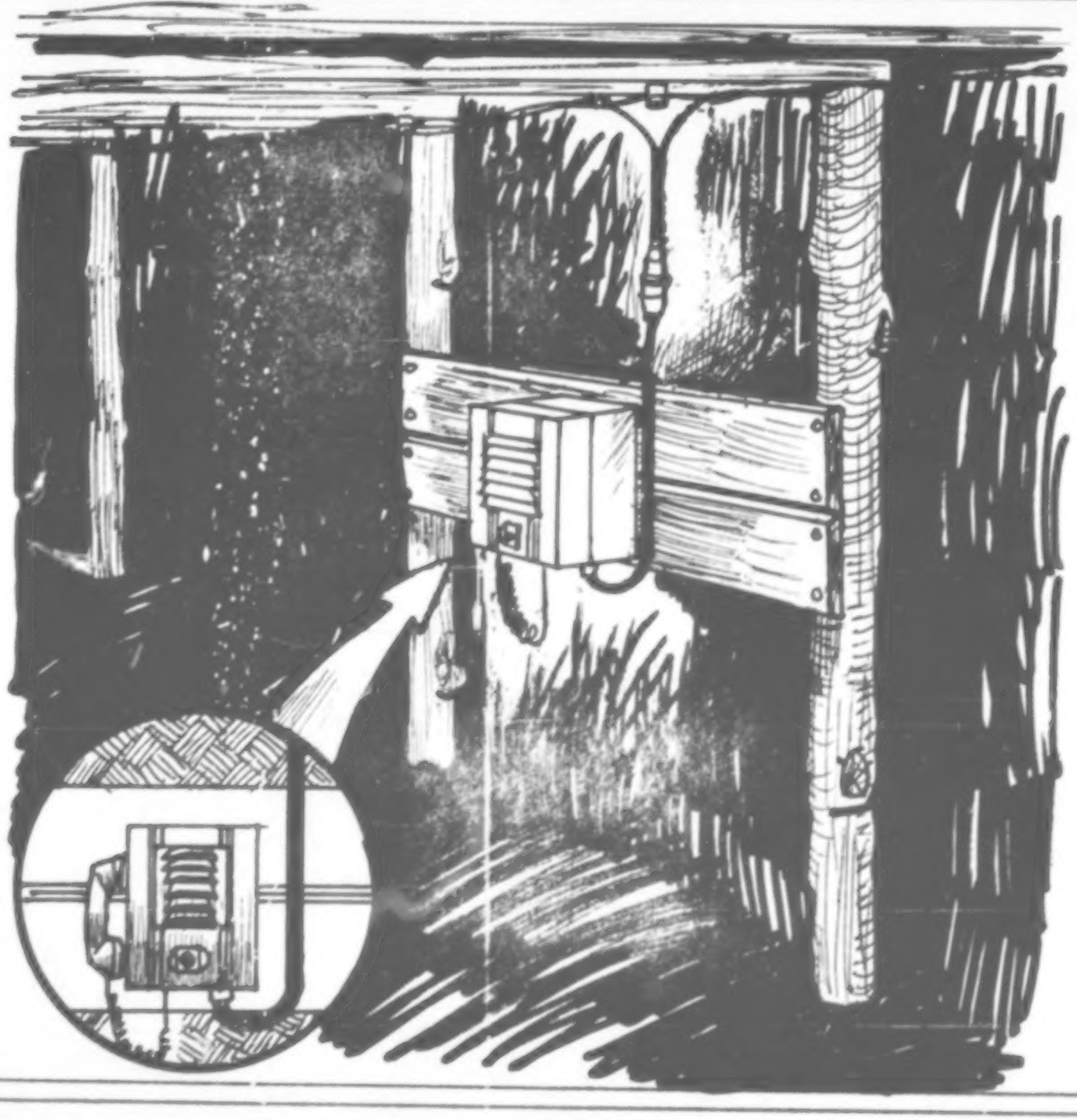

HOLE PROVIDED FOR MOUNTING ON PROPS... RIBS... ETC.
FRONT VIEW
PA. SPEAKER
CALL BUTTON
TOGGLE SWITCH for ON-OFF PA. SYSTEM (PAGER)
COMMUNICATION LINES
BATTERY
INSIDE VIEW

FIG. 2 SUGGESTED METHOD OF INSTALLING A PAGER ON MINE TIMBERING.



ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2 STUDENT NAME ________

UNIT 05 MODULE 01 TASK 040 INSTRUCTOR ________

DATE COMPLETED ________ INSTRUCTOR'S INITIALS ________

TASK TITLE: *Audio and Olfactory Mine Communications.*

Objective:
After studying the information sheet, the student will explain the various types of audio communications and olfactory communications in the mine by answering the review questions to 90% accuracy.

Procedure:
1. Read the objective several times.
2. Study the information sheet.
3. Answer all review questions.

Review Questions:
1. What do sirens at the slope or shaft indicate?

2. What are the two pieces of mobile equipment which are not required to have bells?

3. Briefly define and describe how the stench warning system operates.

ISSUE 1 DATE 6/15/77 P 1 OF 2

REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. L. Thomas Gailey

INFORMATION SHEET

Sound communication is limited to small areas with the exception of the intercom system. Sirens, whistles and bells are located throughout the mine as various signals to that section. Sirens located at the slope or shaft indicate the hoist is in operation loading or unloading trips. All mobile equipment, except for continuous miners and pinners, are required to have bells to signal with.

Outside mobile equipment must have back up alarms, such as bells, buzzers or horns to warn those behind them.

Sound devices, in co-operation with visual alarms, are used for emergency signals. The Audio-visual fire alarm system, covered under another task title of the same name, is required in all coal mines by federal law 75.1103.

Another one of the human senses used to communicate in the mines is smell or olfactory. The stench warning system is an alarm system which injects a nonexplosive nontonic mixture (usually ethyl mercaptan-freon) into the intake ventilating air and where possible. Those mines which use the stench warning system should hold occasional drills so that employees recognize the odor and to determine the amount of mixture needed to completely cover the mine workings. Because of the fast air circulation in the mine, the stench is usually quickly diffused and carried out of the mine.

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PROGRAM D-2 STUDENT NAME

UNIT 06 MODULE 01 TASK 040 INSTRUCTOR

DATE COMPLETED INSTRUCTOR'S INITIALS

TASK TITLE: *Building a Regulator.*

Objective:
The student will build a regulator in a wet wall brattice to meet the instructor's approval and correctly answer all the review questions.

Tools and Materials:

1. Trowel
2. Pick and shovel
3. Brick hammer
4. Saw
5. Ax
6. Level
7. Mason Twine
8. Tape Measure
9. Heavy plank (rough timber)-3" x 6" or 3" x 8"
10. Cement blocks
11. Cap pieces
12. Morter mix
13. Water
14. Rock dust
15. 8, 10 or 12 penny nails
16. Ready-made door or plywood

Procedure:

1. Read the objective at least twice.
2. Read and review information sheet.
3. Study illustrations.
4. Answer review questions.
5. Build a regulator in a wet wall brattice.
6. Have instructor check completed work.

Review Questions:

1. Explain the purpose of regulators in the mine.

2. Why construct the regulator in the return air entry?

3. Build a regulator in a wet wall brattice. Have instructor check completed work.

ISSUE 1 DATE 12/2/76 P 1 OF 3

REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. Joseph Ciccotelli

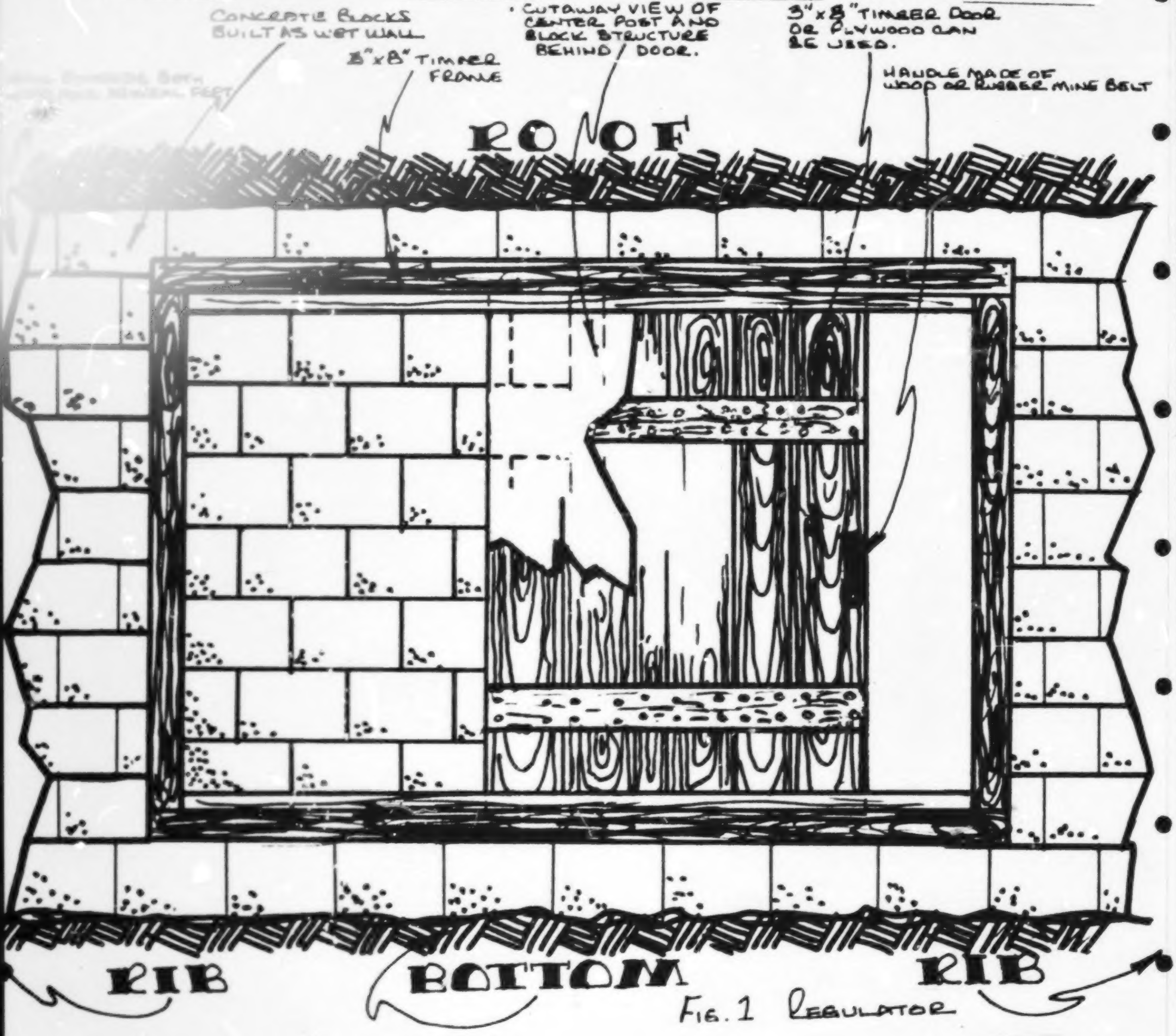
CONCRETE BLOCKS BUILT AS WET WALL
[illegible] SURROUNDING BOTH [illegible] MINIMAL FEET
8"x8" TIMBER FRAME
CUTAWAY VIEW OF CENTER POST AND BLOCK STRUCTURE BEHIND DOOR.
3"x8" TIMBER DOOR OR PLYWOOD CAN BE USED.
HANDLE MADE OF WOOD OR RUBBER MINE BELT
ROOF
RIB
BOTTOM
RIB

FIG. 1 REGULATOR

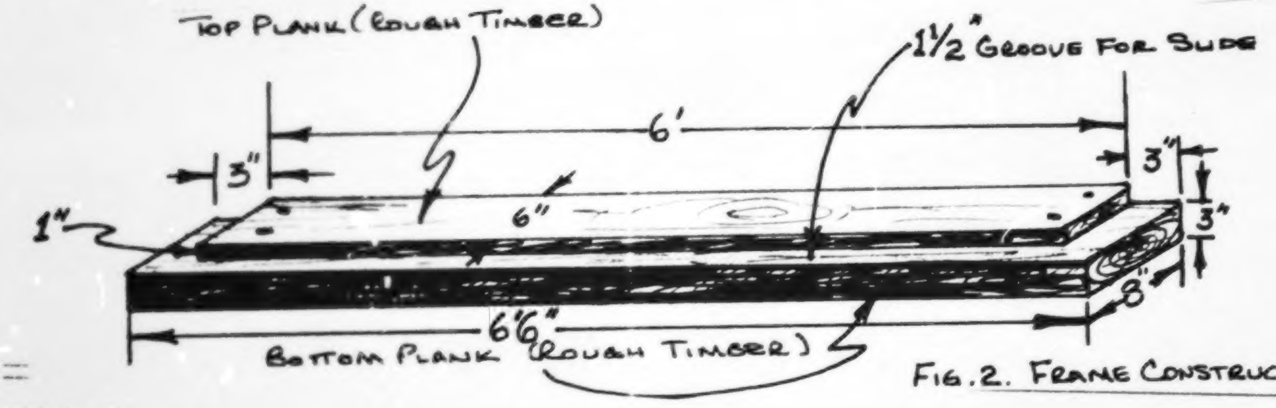
TOP PLANK (ROUGH TIMBER)
1½" GROOVE FOR SLIDE
6'
3"
3"
1"
6"
3"
8"
6'6"
BOTTOM PLANK (ROUGH TIMBER)

FIG. 2. FRAME CONSTRUCTION

PROGRAM D-2 UNIT NO. 06 MODULE NO. 01 TASK NO. 040

INFORMATION SHEET

Regulators

To assure each working section of enough air, regulators are build in the return air entries to permit only the amount of air needed in each working section to pass through.

A regulator with an adjustable door (usually a sliding door) is constructed in a brattice. The frame work of a regulator must be made of heavy plank (3" x 6" or 3" x 8") which will take the pressure from the roof and bottom. The length and height depends on the seam of coal.

For example, if the door of the regulator were to be 4' high and 3' wide and 3" x 8" planks were being used, the tip and bottom planks would be about 6'6" long, the two end planks 4'2" long, and the center plank 4' long. A 1" x 6" x 6' board placed 1 1/2" from the edge of the plank and 3" from either end forms a slide groove. See fig. 2 and 3.

Once the door is arranged, 1" x 4" x 6' boards are nailed on the outside of the groove to keep the door in place.

Whenever possible, a regulator should be placed in the return air entry because they cause air to be drawn in through the belt entry when placed on the intake side.

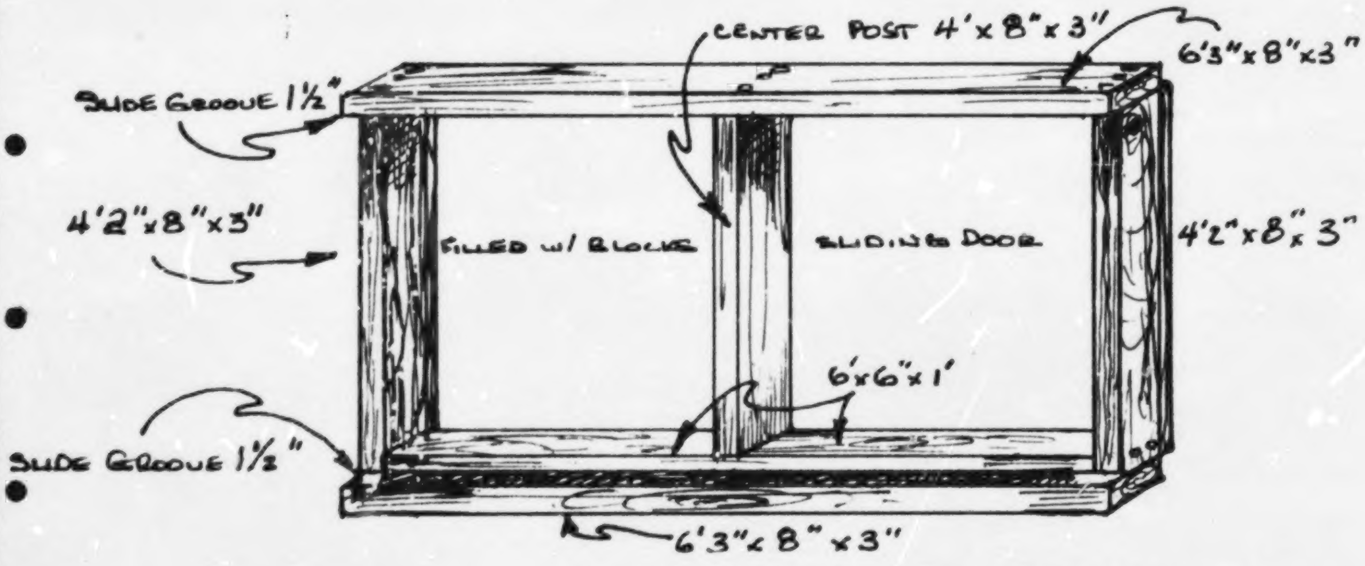

FIG. 3 REGULATOR FRAME

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
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PROGRAM D-2
STUDENT NAME ____________________
UNIT 06 MODULE 01 TASK 050
INSTRUCTOR ____________________
DATE COMPLETED ____________________
INSTRUCTOR'S INITIALS ____________________

TASK TITLE: *Mine Doors.*

Objective:
The student will identify the uses of various mine doors and construct a double track entry door, a set of air lock doors and either a trap door or escape-way door in wet wall brattices by completing the review questions to meet the instructor's approval.

Tools and Materials:

Air Lock Doors
- Trowel
- Pick
- Shovel
- Brick Hammer
- Saw
- Ax
- Level
- Mason Twine
- Tape Measure
- Doors
- Heavy Plank
- Hinges
- Cement Blocks
- Cap pieces
- Mortar mix
- Rockdust
- Water
- 8, 10, or 12 penny nails
- Nuts & Bolts

Trap Door or Escape-way Door
- Trowel
- Pick
- Shovel
- Brick hammer
- Saw
- Ax
- Level
- Mason Twine
- Tape measure
- Steel Door
- Heavy planks
- Hinges
- Cement Blocks
- Cap pieces
- Mortar mix
- Rockdust
- Water
- 8, 10, or 12 penny nails
- Nuts and Bolts

Track Entry Door
- Trowel
- Pick
- Shovel
- Brick Hammer
- Saw
- Ax
- Level
- Mason Twine
- Tape Measure
- Single or double doors
- Filler material
- Hinges
- Mortar Mix
- Rock dust
- Water
- 8, 10, or 12 penny nails
- Heavy planks
- Nuts & Bolts
- Single doors only:
  - 2 iron bars
  - 2 lock washers & nuts

Procedure:
1. Read the objective at least twice.
2. Read and review information sheet.
3. Study the illustrations.
4. Answer the review questions.

ISSUE 1
DATE 1/21/77
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REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. Joseph Ciccotelli

5. Construct a double track entry door, an air lock door across a track entry, and either a trap door or escape-way door.
6. Have instructor check after each completed door.
7. Clean up.

Review Questions:

1. Explain the purpose of the following doors:
   (a) double track entry door

   (b) air lock doors

   (c) trap door

   (d) escape-way door

2. Construct:
   (a) double track entry door

   (b) air lock doors

   (c) trap door

   (d) escape-way door

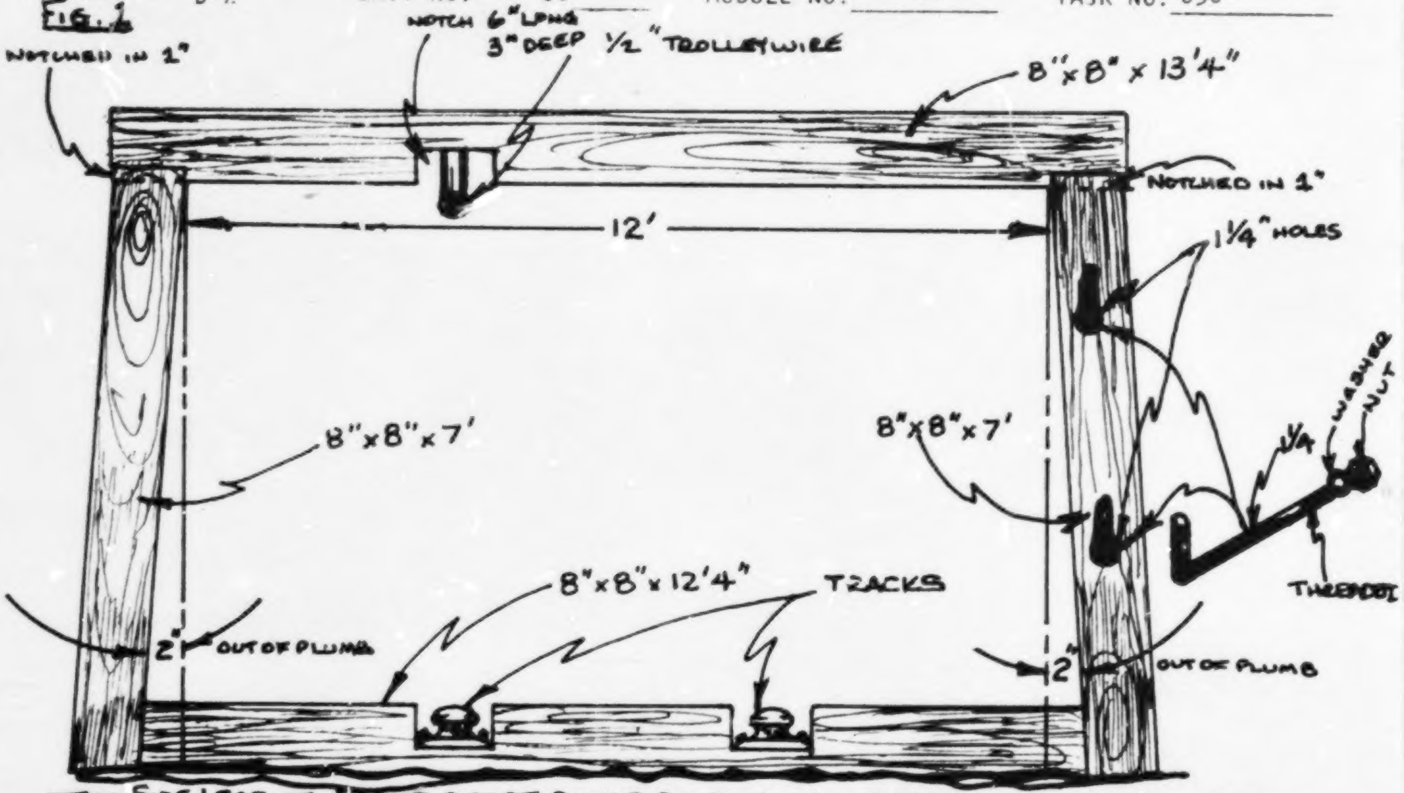
INFORMATION SHEET

Mine doors should always be constructed to open into the intake air so that air pressure will keep them closed. By constructing the top of the door off plumb 10° to 20° or by building both ends of the base 2" off plumb toward the ribs, gravity will keep them closed. See Fig. 1.

Track Enry Doors
Doors in a track entry should have at least a 12' opening and can be made with a single 12' door hung from one side of the entry or two 6' doors hinged on both sides, depending on the support needed.

The frame should be built from 8" x 8" timber (when using two 6' doors, 6" x 6" timber is sufficient) about 2" out of plumb for automatic closing. The doors are made from two layers of boards set in opposite directions (see fig. 1) and are held in place by iron bars threaded at one end and bent in a right angle (90°) at the other end. Single doors are bolted into the frame with a lock washer and nut. Notches are cut at the top and base of the frame to allow for track and trolley wires to pass through. (Refer to trolley wire permissibly from Federal Mining Electricity Laws.) These notches are extended to the end of the door to avoid interference with track and trolley wires while still minimizing air leakage. On single doors hinges are held from the frame by washers. The lower set of hinges on the doors are extended about 1 1/2" longer than the top set in order to offset the weight of the door and cause automatic closing. Filler material (brick, block or wood covered with mortar) is used around the frame of the door to seal air out. See figs. 2, 3.

FIG. 1


NOTCHED IN 1"
NOTCH 6" LONG 3" DEEP
1/2" TROLLEY WIRE
8"x8" x 13'4"
NOTCHED IN 1"
12'
1 1/4" HOLES
WASHER
NUT
1/4
THREADED
8"x8"x7'
8"x8"x7'
8"x8"x12'4"
TRACKS
2" OUT OF PLUMB
2" OUT OF PLUMB

← SIDE LEGS OF FRAME OUT OF PLUMB SO DOOR WILL CLOSE AUTOMATICALLY →

- AIR LOCK DOORS ON TRACK ENTRY CAN BE SEVERAL HUNDRED FEET APART.

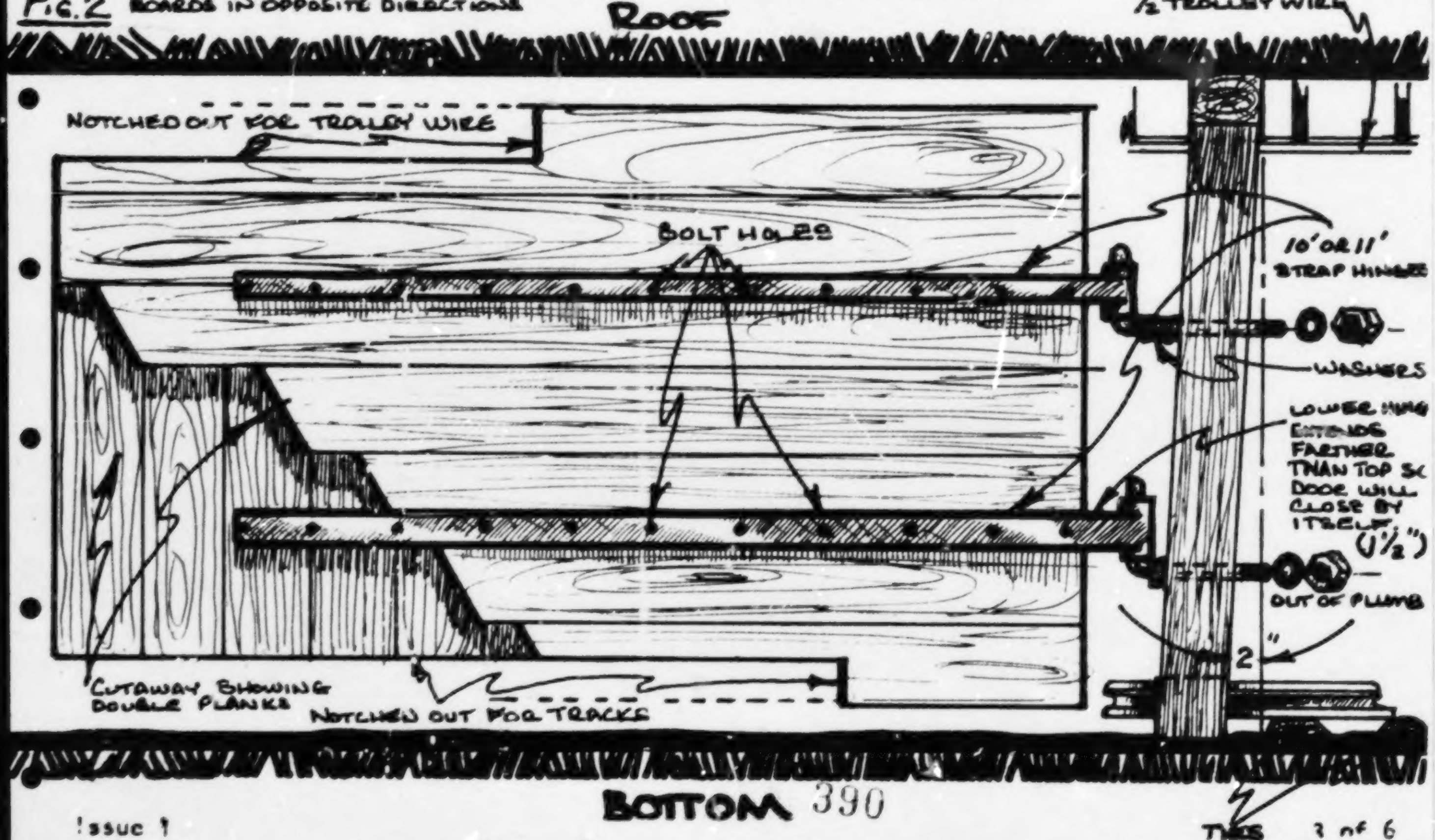
TRACK ENTRY FRAME AND DOOR

(OPEN VIEW)

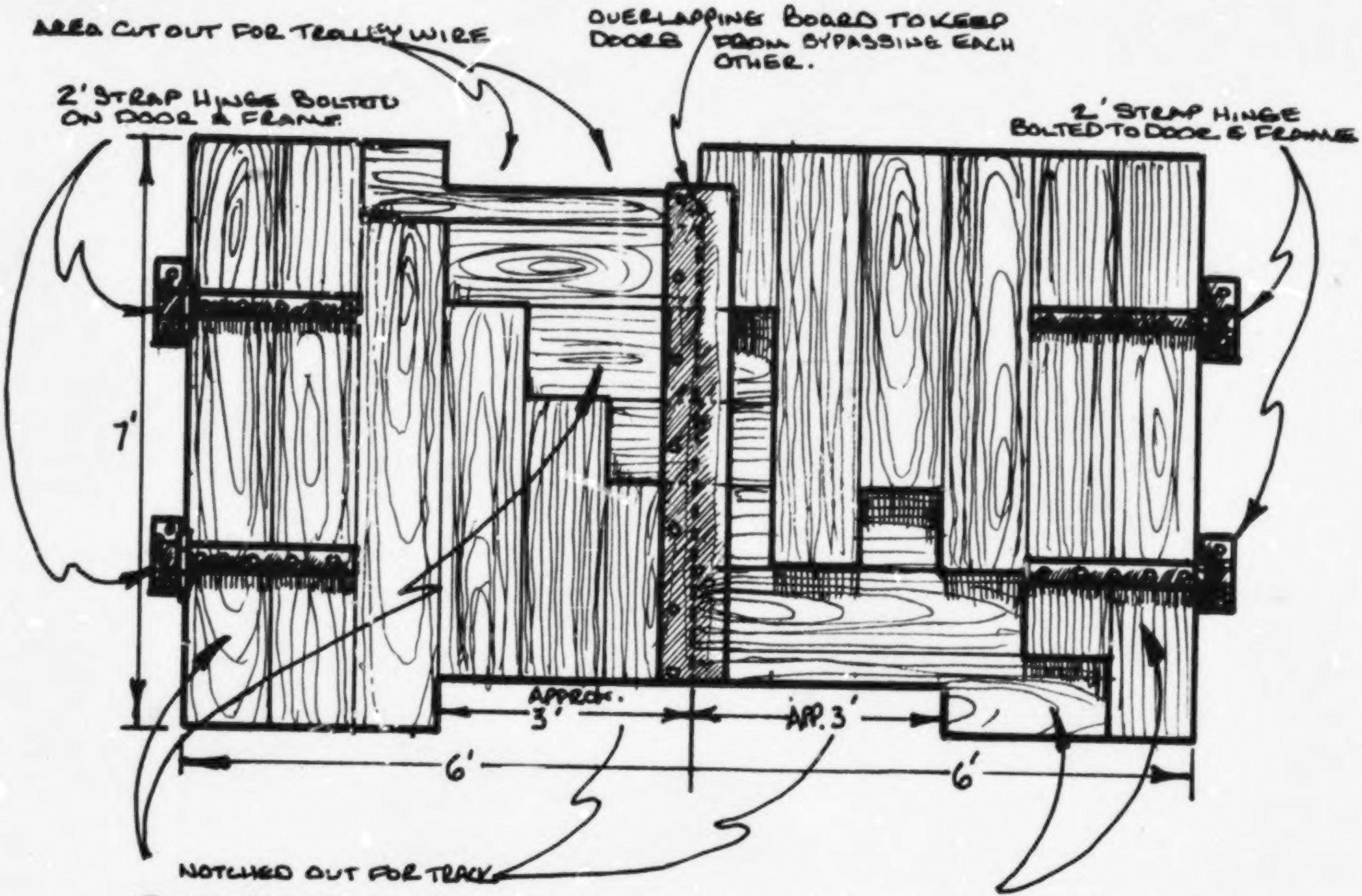
SINGLE DOOR IS APPROX. 7'x12'6"

- DOOR CONSTRUCTED OF 2 LAYERS OF 7/8" TONGUE AND GROOVED BOARDS IN OPPOSITE DIRECTIONS

FIG. 2


ROOF
1/2" TROLLEY WIRE
NOTCHED OUT FOR TROLLEY WIRE
BOLT HOLES
10' OR 11' STRAP HINGES
WASHERS
LOWER HING EXTENDS FARTHER THAN TOP SO DOOR WILL CLOSE BY ITSELF. (1 1/2")
OUT OF PLUMB
2"
CUTAWAY SHOWING DOUBLE PLANKS
NOTCHED OUT FOR TRACKS
BOTTOM
TIES

PROGRAM D-2 UNIT NO. 06 MODULE NO. 01 TASK NO. 050


AREA CUT OUT FOR TROLLEY WIRE
OVERLAPPING BOARD TO KEEP DOORS FROM BYPASSING EACH OTHER.
2' STRAP HINGE BOLTED ON DOOR & FRAME
2' STRAP HINGE BOLTED TO DOOR & FRAME
7'
APPROX. 3'
APP. 3'
6'
6'
NOTCHED OUT FOR TRACK

• DOUBLE DOORS ARE MADE WITH 2 LAYERS OF BOARDS IN OPPOSITE DIRECTIONS OR ONE LAYER OF PLYWOOD AND A LAYER OF BOARDS.

FIG. 3 **DOUBLE DOORS**
ON TRACK ENTRY

ISSUE: 1

Air Lock Doors
Air lock doors are used in entries, such as track, supply and belt, where it is necessary for personnel and equipment to pass through and interrupt the flow of air. Air locks usually consists of two sets of doors so when one door is open, the other door will be closed, thus preventing air flow breakage. Air lock doors are built so they automatically close after personnel or equipment pass through.

Regulators Across Belt Entries - Air locks across belt entries
Air locks across belt entries are constructed to block air flowage but still allow an opening for a belt to pass through. The framework construction must include a beltway frame plus a personnel entry framework built into the same brattice as a unit. See fig. 4.

The outside framework is built from 3" x 8" timber, lengths depending on the width of the belt and height of the coal. A used, discarded mine belt is cut so it can be stretched from one side to the framework across to the other side, thus forming "tunnels" or openings between the discarded mine belt to allow the belt cables to flow through.

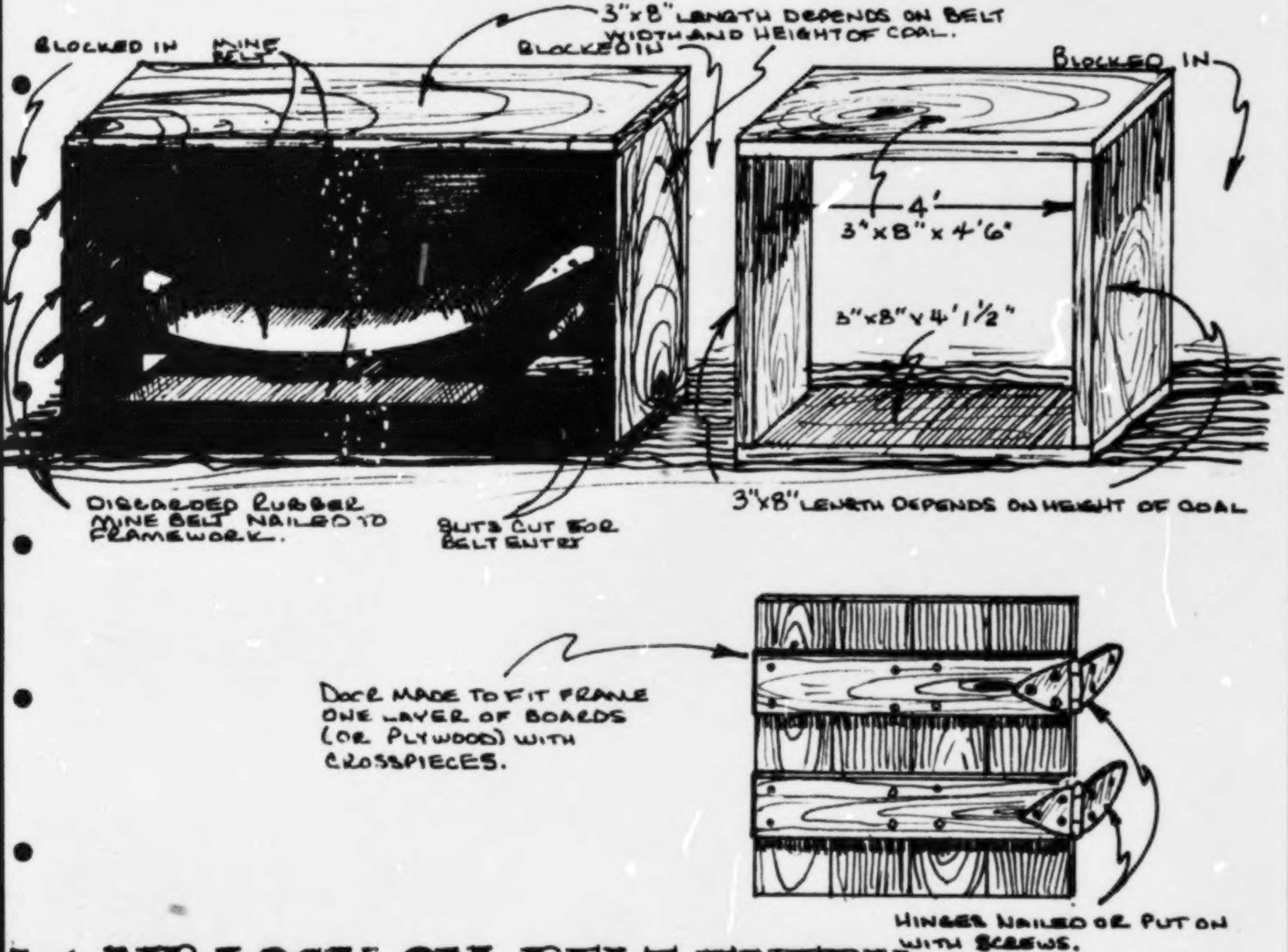

3"x8" LENGTH DEPENDS ON BELT WIDTH AND HEIGHT OF COAL.
BLOCKED IN
MINE BELT
BLOCKED IN
BLOCKED IN
4'
3"x8"x 4'6"
3"x8"x 4'1½"
DISCARDED RUBBER MINE BELT NAILED TO FRAMEWORK.
SLITS CUT FOR BELT ENTRY
3"x8" LENGTH DEPENDS ON HEIGHT OF COAL
DOOR MADE TO FIT FRAME ONE LAYER OF BOARDS (OR PLYWOOD) WITH CROSSPIECES.
HINGES NAILED OR PUT ON WITH SCREWS.

Fig.4 AIR LOCK ON BELT ENTRY

• 2 SETS OF DOORS FROM 10' TO 50' APART

Personnel entry frames are made from 3" x 8" timber about 4' in length, also conforming to the height of the coal. The entry door is built with one layer of boards nailed together (or a piece of plywood) with two wooden crosspieces hinged by nails or screws from the door to the framework. The door must always be made to open facing the incoming air. The air lock door may be built from 10' to 50' apart.

The two frameworks, the belt entry and the regulator entry, are bratticed to form a wall from rib to rib.

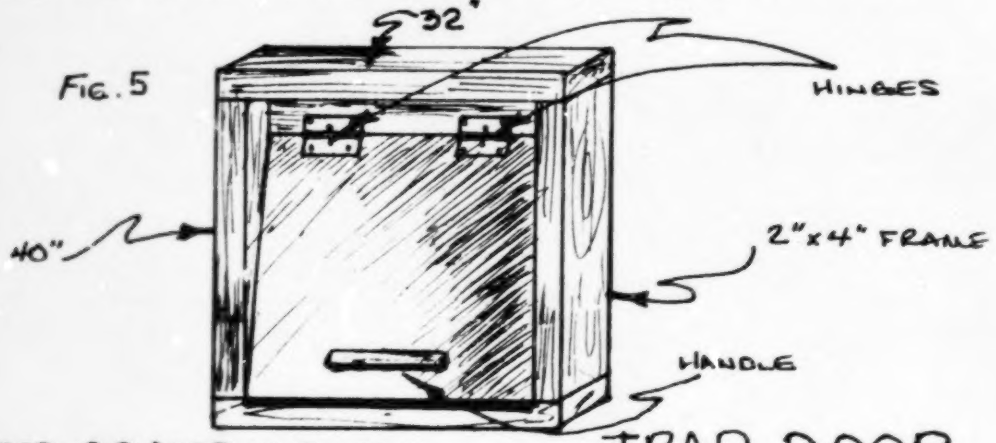
Trap Doors

A trap door may be built in a brattice as a means of moving freely from one entry to another or as an escape way from fire, smoke, and other dangers. They usually come ready-made with automatic closing action. The trap door opening must be large enough to allow a man to get through easily. See Fig. 5.

Escape-Way Doors

Escape-way doors are so called because they are used along escape ways. Safety rules demand the doors be made of steel and at least 4' x 4' so that a man or stretcher can move through freely. See fig. 6.

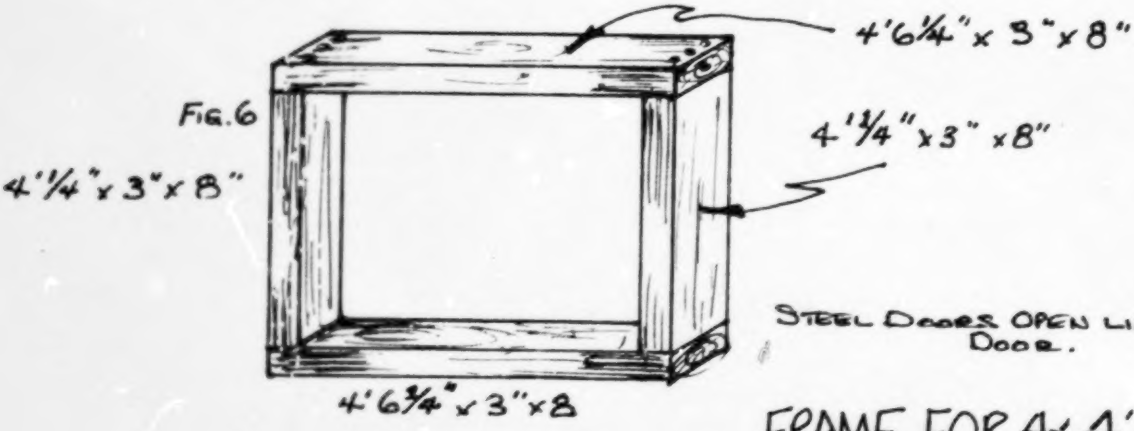
FIG. 5



• A TRAP DOOR IS PLACED IN EVERY FOURTH OR FIFTH BRATTICE

TRAP DOOR
(USUALLY PRE-ASSEMBLED)

FIG. 6



STEEL DOORS OPEN LIKE REG. DOOR.

FRAME FOR 4'x4' STEEL ESCAPEWAY DOOR.

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EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
STUDENT NAME
UNIT 06 MODULE 02 TASK 010
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *How and Why a Mine is Ventilated.*

Objective:

After studying the information sheet and illustrations, the student will show he correctly understands how and why a mine is ventilated by answering the review questions to 80% accuracy.

Procedure:

1. Read the objective several times.
2. Read and review the information sheet.
3. Carefully study the illustrations.
4. Answer all review questions.

Review Questions:

1. Briefly explain what is meant by the term mine ventilation.

2. What is the minimum air velocity required at the last open crosscut? At the face?

3. What is the purpose of the main fan?

4. What are some federal requirements for the installation of main fans?

5. 6. 7. Name three control devices and briefly describe and explain the purpose of each.

8. Define: Air split.

9. How often must the mine ventilation plan be reviewed?

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RESEARCH
INSTRUCTOR
ADMINISTRATION
PREPARED BY: Mr. Ronald Bellock

10. Who must review the ventilation plan?

INFORMATION SHEET

The main function of ventilation in the mine is to provide a safe and healthy environment for the miner by producting an air-current which dilutes and carries away dangerous gases, and dust and supplies fresh air in the mine. It is necessary to constantly change mine air because men cannot live without an adequate and constant supply of pure air. The amount of methane and dust produced far surpasses the amount of coal extracted by the continuous-mining equipment. Ventilation also removes heat released by the surrounding rock. Federal Laws requires strict ventilation regulations which, although necessary, are difficult to maintain.

According to regulation 75.301, the air at all active working places must contain at least 19.5 percent oxygen and methane. The minimun air velocity must be from 6,000 to 9,000 cubic feet per minute at the last open crosscut and 3,000 cubic feet per minute at each working face. The most air velocity permitted in trolley entries is 250 feet per minute. Belt-conveyor entries can no longer be used as main-intake airways.

Ventilating Current

The body of air that flows through a mine is termed ventilating current. Each mine must have at least one intake opening through which the current is forced into the mine and one return or exhaust opening through which the current is removed. The air is forced into the intake opening by a main fan which, according to federal law 75.300, must be installed on the surface at least 15 feet from the mine opening in fireproof housing and connected to the opening by fireproof air ducts. See fig. 1.

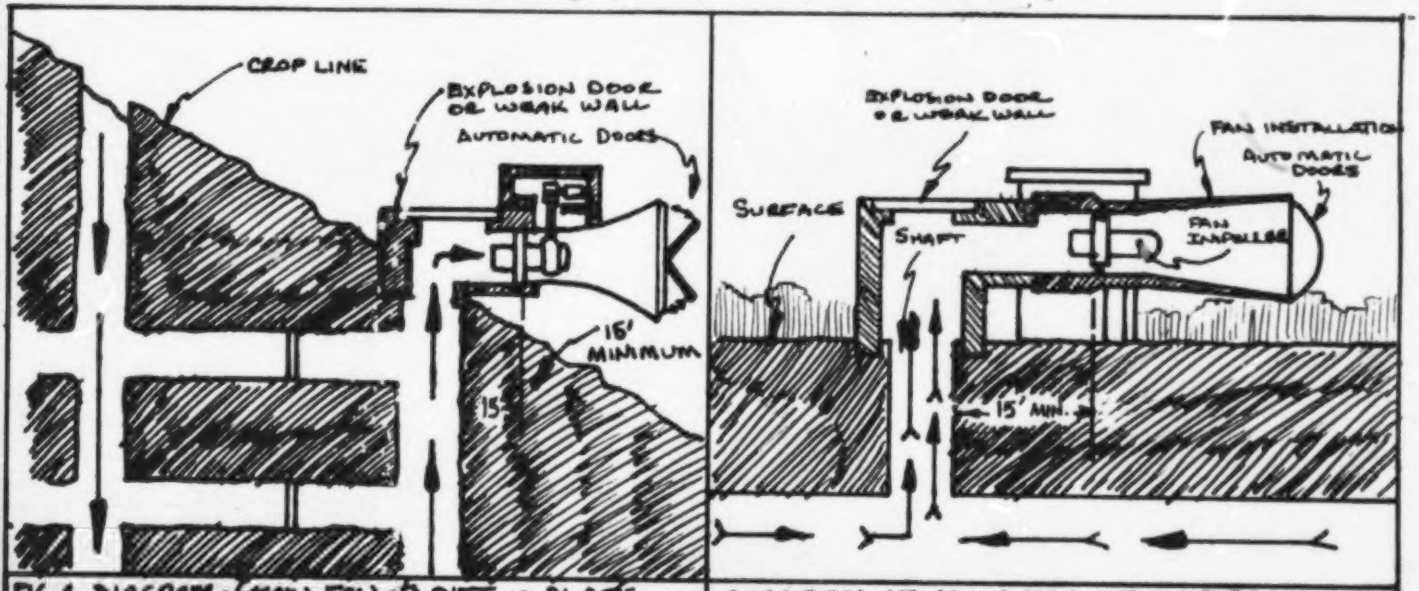


FIG.1 DIAGRAM of MAIN FAN at DRIFT or SLOPE

DIAGRAM OF MAIN FAN AT SHAFT

Air Splitting
Since the number of men working in one air current is limited by law, each active working place must have its own air split to assure an uncontaminated fresh air supply. Also, by selecting portions of the mine the possibility of an explosion spreading to another section is reduced.

The air from the main current is divided into separate flows called splits, which are used to ventilate the separate working sections. Since one part of the mine might need greater ventilation, regulating devices are used to control the currents. See Fig. 2.

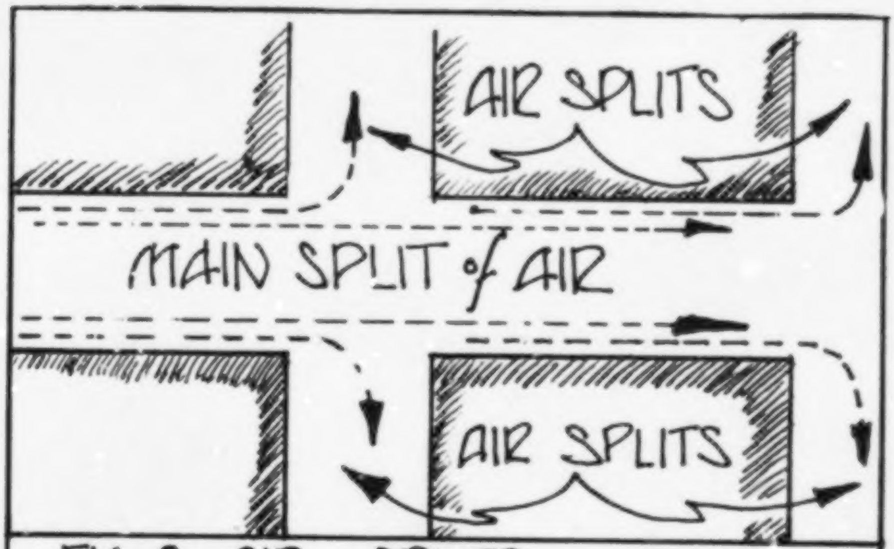


FIG 2 AIR SPLITS

Air splits can either be a natural split or an artifically controlled split. In a natural division, the amount of air can be controlled by differing the section area, wall texture, or passageway length.

Control Devices
There are three types of control divices used in the mines: stopping, overcasts (or undercasts) and regulators.

Stopping are airtight walls installed across mine passages to direct airflow or seal off portions of a mine. They may be either temporary, made of metal doors, jute, plastic or rough timber, or permanent, made of masonry or metal panels. See fig. 3.

Overcasts and/or Undercasts are "air bridges" which allow airstreams to cross without mixing. Overcasts are required for split system of ventilation as they prevent the mixing of intake and return air. They are usually built with concrete block set in mortar. See fig. 4.

FIG.3 A STOPPING

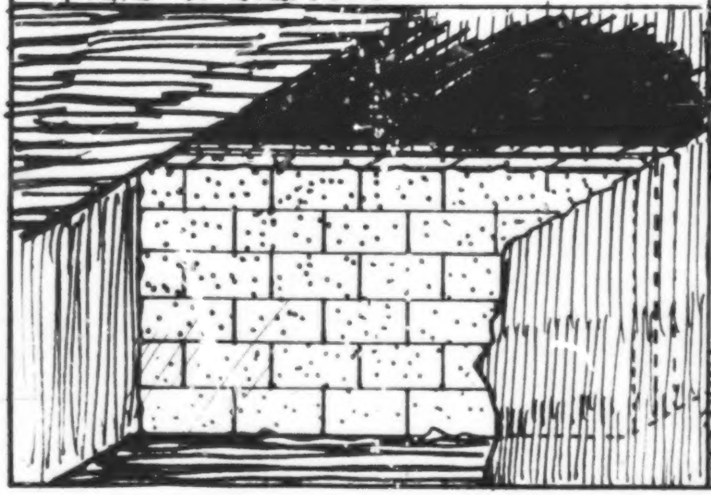
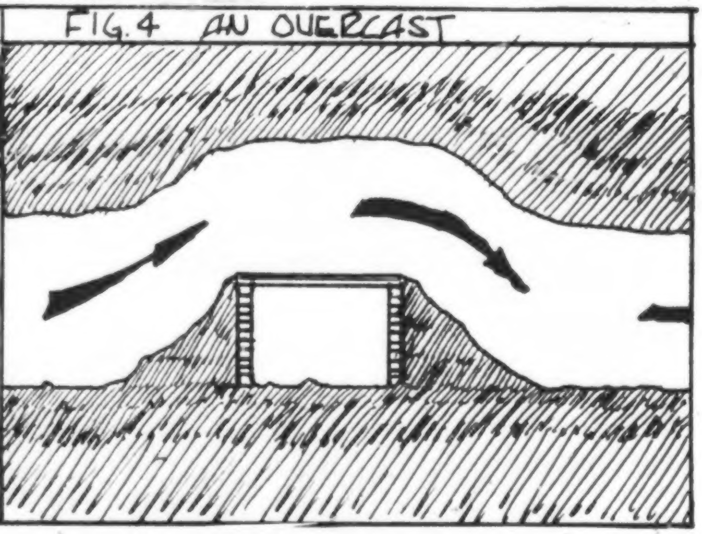


FIG.4 AN OVERCAST



Regulators are used to increase resistance of low-resistance splits and are necessary for efficient mine air distribution. The most commonly used regulator is the sliding-door regulator because it is convenient, out of the way and does not interfere with haulage. See fig. 5.

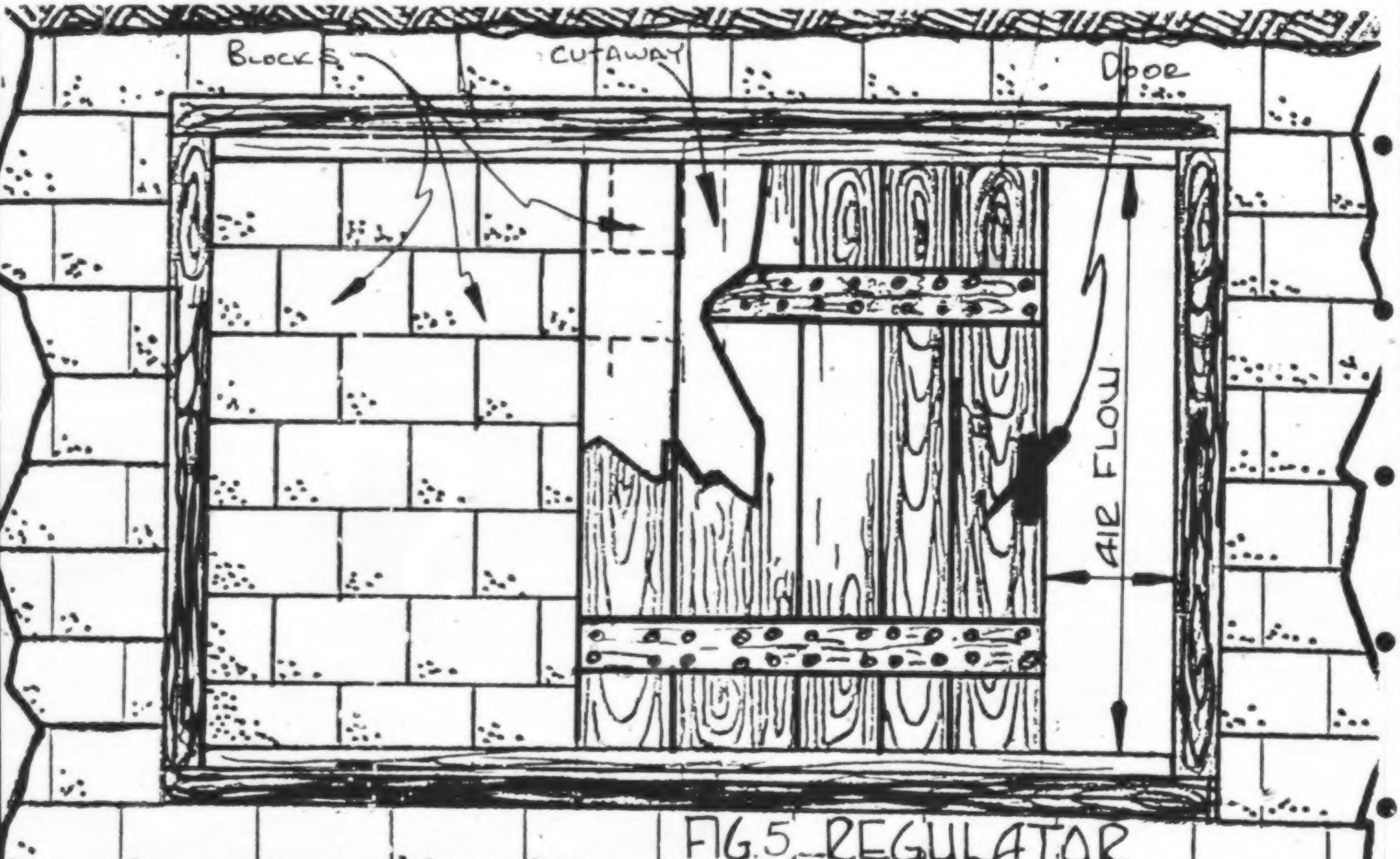


FIG.5 REGULATOR

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Air used to vertilate a working face can be used to ventilate a gob area or pillar line before entering the return, but rarely can the air passing over a gob area or pillar line be used to ventilate a working space before entering the return. The working space should be ventilated first.

A mine ventilation system must be carefully planned and maintained. As the mine increases in size, the ventilation paths are always being extended or retracted. For this reason, the mine ventilation plan must be updated and reviewed by the operator and the Secretary of the Interior at least every 6 months. (75.316)

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EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
STUDENT NAME
UNIT 06 MODULE 02 TASK 020
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *Identify Symbols On A Ventilation Map.*

Objective:

The student will identify and draw certain symbols on a ventilating map and answer all review questions to 90% accuracy.

Procedure:

1. Read the objective at least twice.
2. Read and review information sheet.
3. Study the illustrations.
4. Answer all review questions.

Review Questions:

1. Draw the symbols for temporary and permanent stoppings, regulators, belt strip regulators, curtains, doors and air lock doors, trap doors, and overcast and undercast below.

2. Identify the symbols on a ventilating map by labeling each symbol on the map.

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REVIEWED & APPROVED
RESEARCH
INSTRUCTOR
ADMINISTRATION

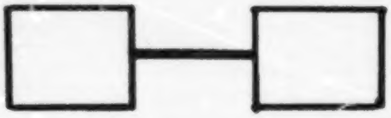
PREPARED BY: Mr. L. Thomas Gailey

PROGRAM D-2 UNIT NO. 06 MODULE NO. 02 TASK NO. 020

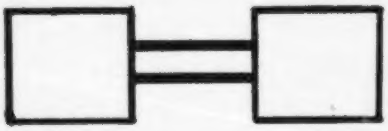
INFORMATION SHEET

Although ventilation map symbols are not standard, the following symbols, or variations of them, are used most often:

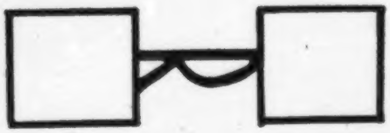
temporary stopping



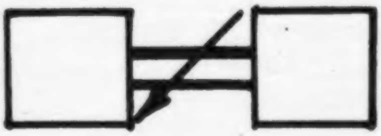
permanent stopping



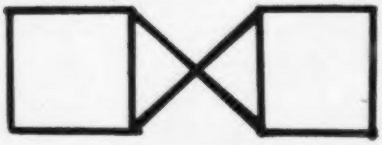
regulator



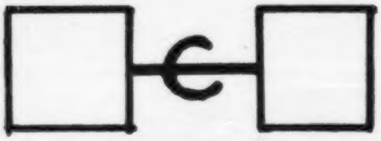
belt split regulator



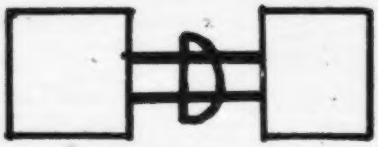
overcast
or undercast



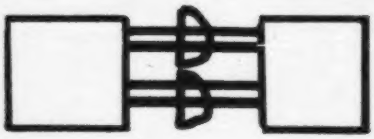
curtain



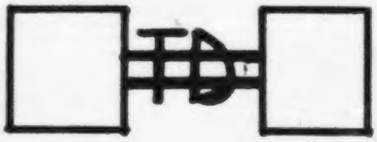
door



air lock door

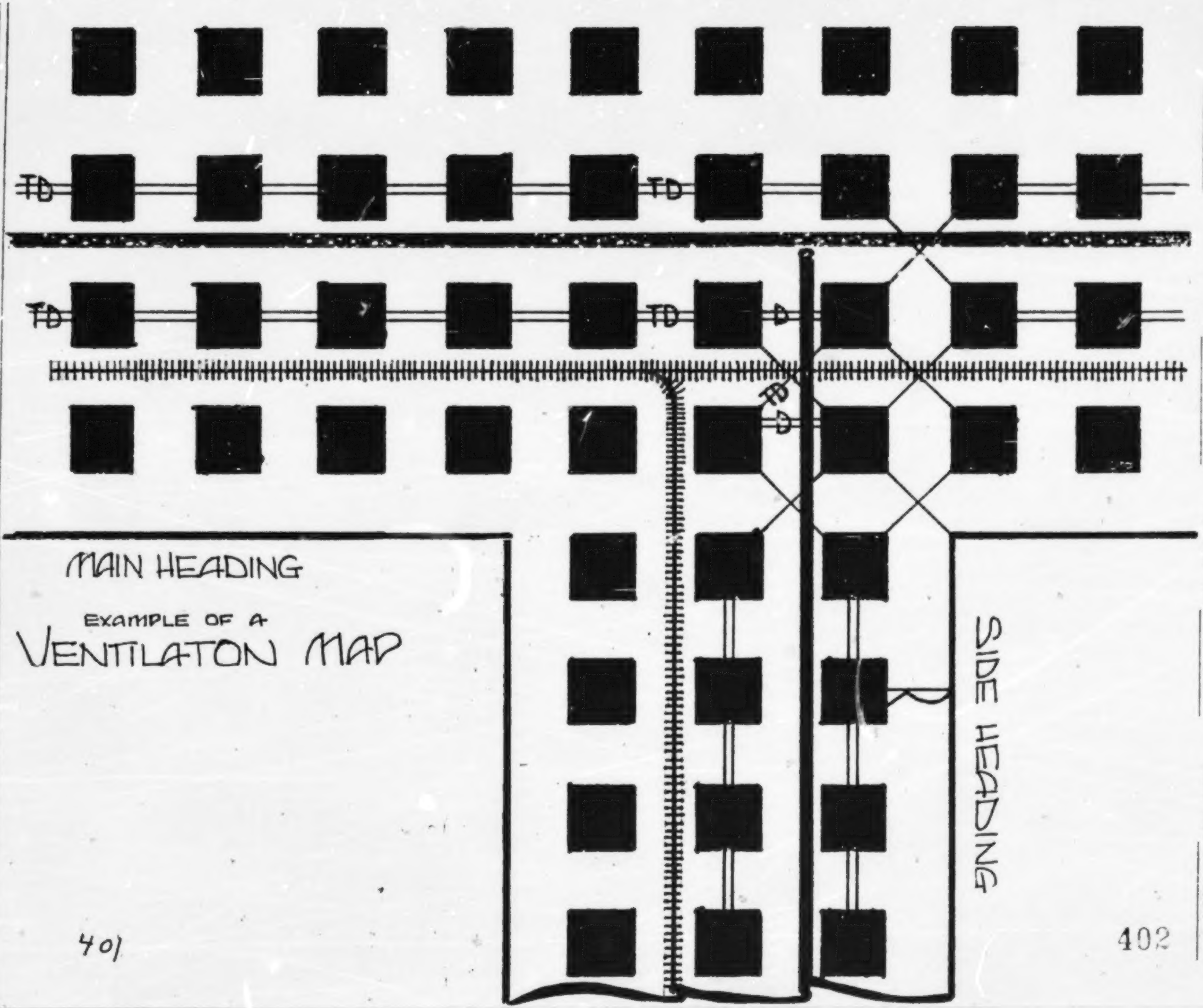


trap door



PROGRAM D-2
UNIT NO. 06
MODULE NO. 02
TASK NO. 020

ISSUE: 1


TD
TD
TD
TD
MAIN HEADING
SIDE HEADING

EXAMPLE OF A
VENTILATON MAP

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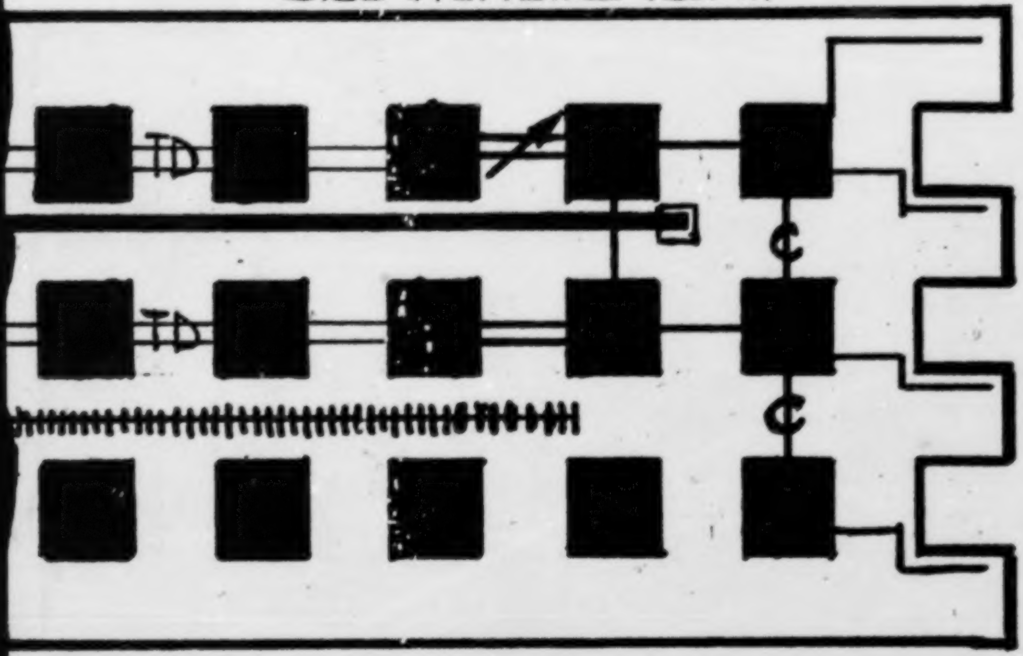
SIDE HEADING (CONT.)



ISSUE: 1

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2	STUDENT NAME
UNIT 06 MODULE 02 TASK 030	INSTRUCTOR
DATE COMPLETED	INSTRUCTOR'S INITIALS

TASK TITLE: *Draw a Mine Ventilation Map with Symbols.*

Objective:

Following the sample map, the student will draw a ventilation map, placing the symbols to re-route the air. The completed work must meet the instructor's approval.

Tools and Materials:

1. Paper
2. Pencil
3. Ruler

Procedure:

1. Read objective more than once.
2. Study sample ventilation map and symbols.
3. Draw a ventilation map similar to sample map without the symbols.
4. Draw symbols in the proper places so to block off circled mine area.
5. Check your work.
6. Have instructor check completed work.

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REVIEWED & APPROVED RESEARCH INSTRUCTOR ADMINISTRATION

PREPARED BY: Mr. Joseph Ciccotelli

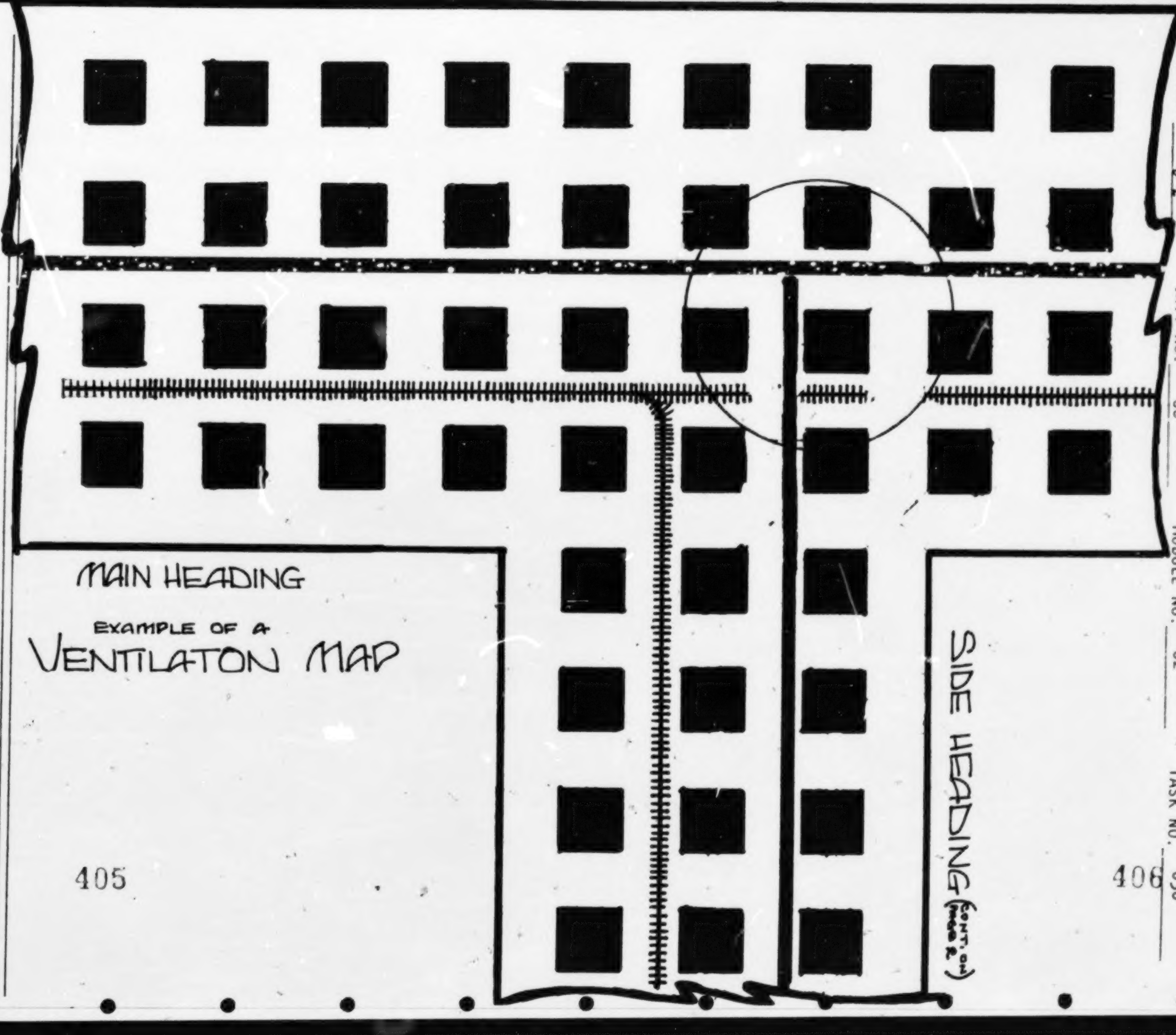
PROGRAM D-2

UNIT NO. 06

MODULE NO. 02

TASK NO. 030

ISSUE: 1


MAIN HEADING
EXAMPLE OF A
VENTILATON MAP
SIDE HEADING (CONT. ON PAGE 2)
405
406

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EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
UNIT 06 MODULE 02 TASK 040
DATE COMPLETED
STUDENT NAME
INSTRUCTOR
INSTRUCTOR'S INITIALS

TASK TITLE: *Hanging Line and Check Curtains.*

Objective:

After studying the information sheet and illustrations, hang a line or check curtain to provide the most efficient ventilation and to meet the instructor's approval and answer all review questions to 80% accuracy.

Introduction:

One important job that a general miner has to perform is to properly hang line or check curtains to efficiently ventilate a working section.

Tools and Materials:

Roll of curtain canvas
Nails
Hammer

Procedure:

1. Read the objective at least twice.
2. Study the information sheet and illustrations.
3. Answer all review questions.
4. Hang either a line or check curtain to provide the most efficient ventilation and to meet the instructors approval.
5. Have instructor check completed work.

Review Questions:

1. Where is line brattice used and why?

2. What material must line curtains be made from? Explain why.

3. What is the recommended material for check curtains? Explain why.

4. Differentiate between line and check curtains.

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DATE 3/25/77
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REVIEWED & APPROVED
RESEARCH
INSTRUCTOR
ADMINISTRATION
PREPARED BY: Mr. Michael Most

5. According to Federal law, how far should exhaust line brattice be installed from the deepest part of the face?

6. State two safety precautions to remember when hanging check curtains.

7. What should a shuttle car operator do when approaching a check or door?

8. Why use curtain brattices and not permanent brattices?

9. When should damaged line brattice be repaired?

10. How far from the rib should line brattice be installed?

INFORMATION SHEET

Check and line curtains are used to divert air into faces and provide ample ventilation in the working area. To provide sufficient ventilation to the working face, Federal law 75.302 requires properly installed and maintained line brattice or other approved devices to be used from the last open crosscut of an entry or room of each working section. Because their purpose is to divert the air, not hold it, they should only be used in the face area. These curtains are required to be made from flame resistant materials. (Federal Law 75.302-3)

When damaged, line and check curtains must be repaired immediately, according to Federal law 75.302. If the damage causes interference with the ventilation of the working face, production must stop until all repairs are completed. (See Federal Law 75.302-2.)

Line Curtains

Line curtains, made from fire-resistant cloth or plastic, are used to channel air to, across and from the face and to prevent short circuiting through the last crosscut.

The line curtains are nailed to the props or headers from the roof to the bottom (See fig. 1) and usually extend from the rib, partially across the room, then turn toward the face and end within 10 feet of the face. Federal law (75.302-1) insists that line brattice be installed no greater than 10 feet from the deepest part of the face unless otherwise approved. This

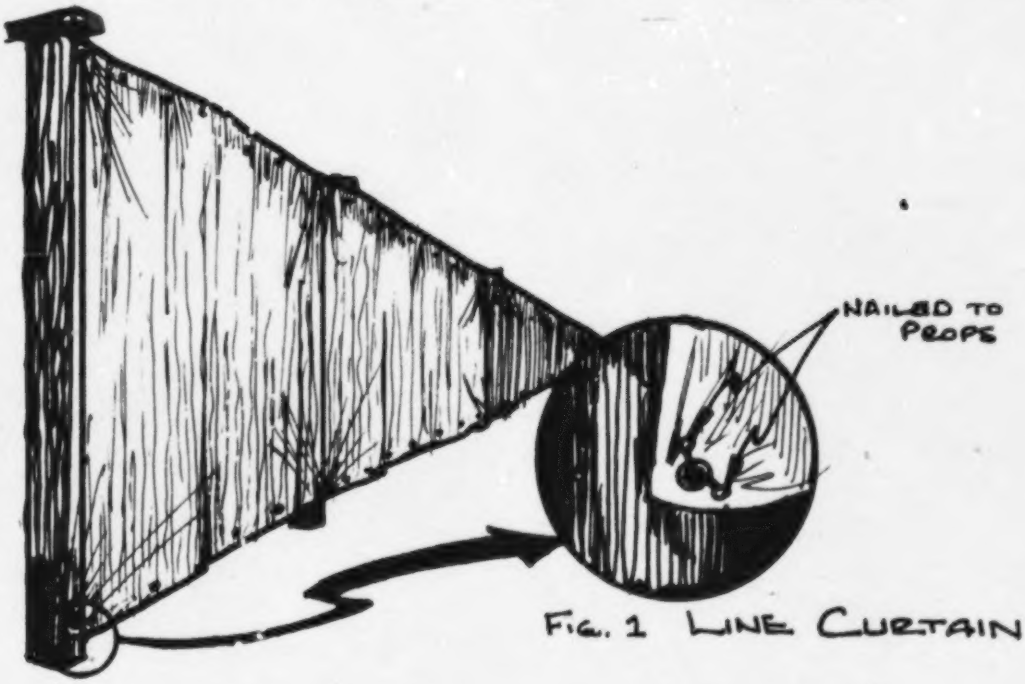


FIG. 1 LINE CURTAIN

space must be large enough to allow enough volume and velocity of air to keep the working face clear of harmful gases, dust and fumes and must be free of obstructions (such as supplies, equipment, debris, etc.)

A common error when installing line brattice is hanging it to close to the ribs and choking off the air current. The air must be allowed to flow freely at all time.

Check Curtains

Run-through check curtains are used to stop or defect air currents, but are made to allow men and machines to pass through them easily. Usually they have a slit down the middle which will open when machines pass through. (See fig. 2)

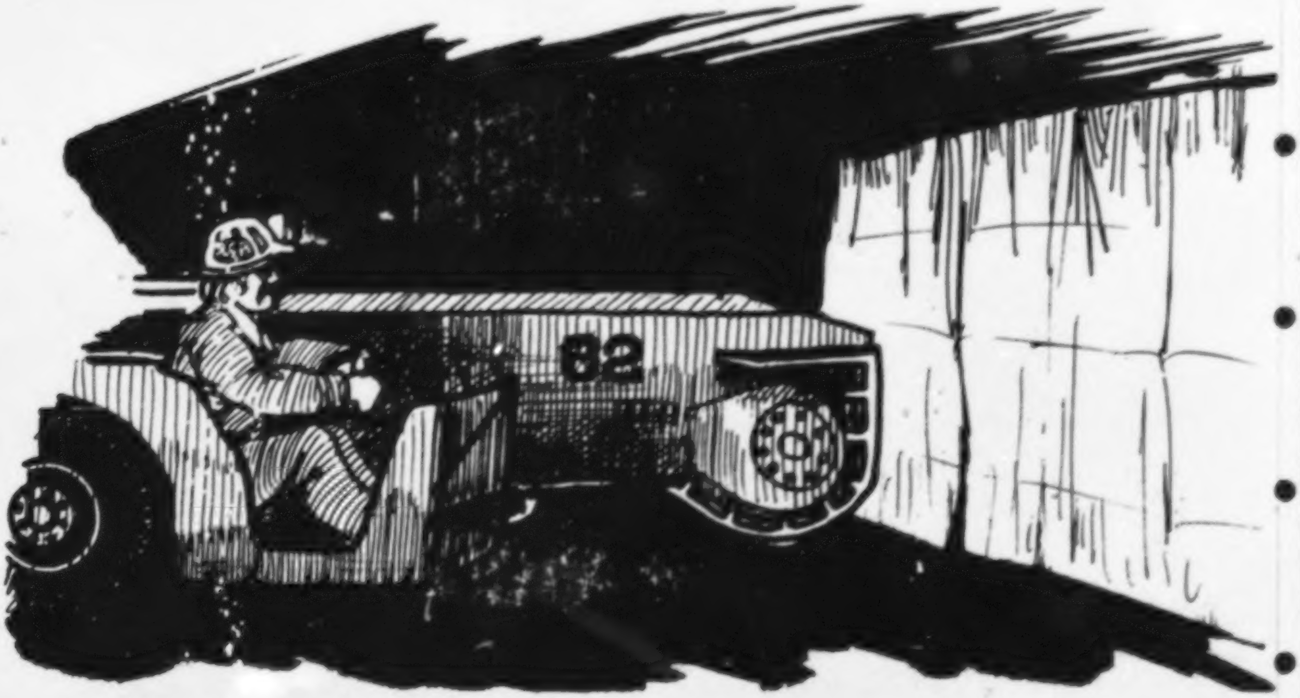
Checks hung across the mouth of crosscuts should be fitted tight against the roof and weighted down or nailed to the bottom in cases where air velocity is strong enough to blow the curtain out.

Check curtains should be made of translucent material through which light can shine. This important safety factor allows workers to see the lights of machinery approaching a check and aids in preventing accidents. Before hanging a check curtain across the heading, all protruding brows or uneven ribs should be trimmed back on both sides of the check curtain to avoid operators striking hidden protrusions. A good location, free of sharp turns, close timbering or other hazards, should be selected for an opening. Equipment operators should be told when a brattice is changed. The warning bell on the shuttle cars should always be rung before passing through a check or door.

PROGRAM D-2 UNIT NO. 06 MODULE NO. 02 TASK NO. 040

It is important to install and maintain the ventilation facilities at their maximum efficientiy to provide pleasant, safe and healthful working conditions.

FIG. 2 PASSING THRU A CHECK CURTAIN.



ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
UNIT 06 MODULE 02 TASK 050
DATE COMPLETED ____________
STUDENT NAME ____________
INSTRUCTOR ____________
INSTRUCTOR'S INITIALS ____________

TASK TITLE: *Face Ventilation.*

Objective:

After reading the information sheet, the student will differientiate between primary and secondary ventilation systems and blower and exhaust methods by answering all the review questions to 87% accuracy.

Procedure:

1. Read and reread the objective.
2. Study the illustrations and the information sheet.
3. Answer all review questions.

Review Questions:

1. What is the minimum quantity of air required to reach each working face?

2. Name the two important parts of the ventilating system and explain what each part consists of and its purpose.

3. What two basic methods are used to ventilate the face?

4. State the advantages of the blower method.

5. What is the main disadvantage of the blower method?

6. Using a single-duct system and an auxiliary fan to ventilate a continuous miner, which method best dilutes methane in the face area?

7. What is the main disadvantage of the exhaust method?

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REVIEWED & APPROVED
RESEARCH ____ INSTRUCTOR ____ ADMINISTRATION ____
PREPARED BY: Mr. Ronald Bellock

8. What should be considered when using the combination exhaust and blower methods?

INFORMATION SHEET

The primary function of mine ventilation is to provide an adequate supply of uncontaminated air right to the working face. Gas (especially methane), dust and fumes are most likely to concentrate at the face since these are results of cutting coal.

Federal law 75.301 requires all active workings to be ventilated by an air current containing at least 19.5 volume percent of oxygen, not more than 0.5 volume percent of carbon dioxide and no harmful quantities of other noxious or poisionous gases. The minimum quantity of air reaching each working face must be 3,000 cubic feet a minute.

While the face ventilation is most important, it is also the most difficult to achieve. It is common for 70 percent of the air to be lost between the surface fan and the face air. Sometimes air must be taken through several miles of underground airways. But with planning and the use of existing techniques, sufficient air volumes can be supplied from the last open crosscut to the active face.

PRIMARY AND SECONDARY SYSTEMS

A ventilation system can be set up with a primary system, which consists of the main fan installation with connected permanent airways and devices used to control the amount and direction of ventilating air, and the secondary system, which includes the face ventilation system, line brattice installations, auxiliary fans and tubing, and check curtains used to control and direct air.

The primary ventilation system will course the fresh air from the last open crosscut to the face and distribute it in the face area. Even though the primary ventilation system is adequate, poor planning and installation of face ventilation control devices may result in poor face ventilation. Many underground methane explosions are the result of inadequate face ventilation.

BLOWER AND EXHAUST METHODS

The two basic methods for ventilating faces are blowing and exhausting. Each method allows for an inlet to and a return from the face. There are advantages and disadvantages to each method.

Blower Method --- Air is directed to the face through the narrower opening between the coal side and line brattice. The return air is led away from the face through the larger division of the heading. See fig. 1.

The blower method not only provides a high velocity of air at the face and readily dilutes face gases, but the positive pressure maintains clearance between rib and line brattice on the intake side. Disadvantages of the blower method are that it carries methane from the face over the machine

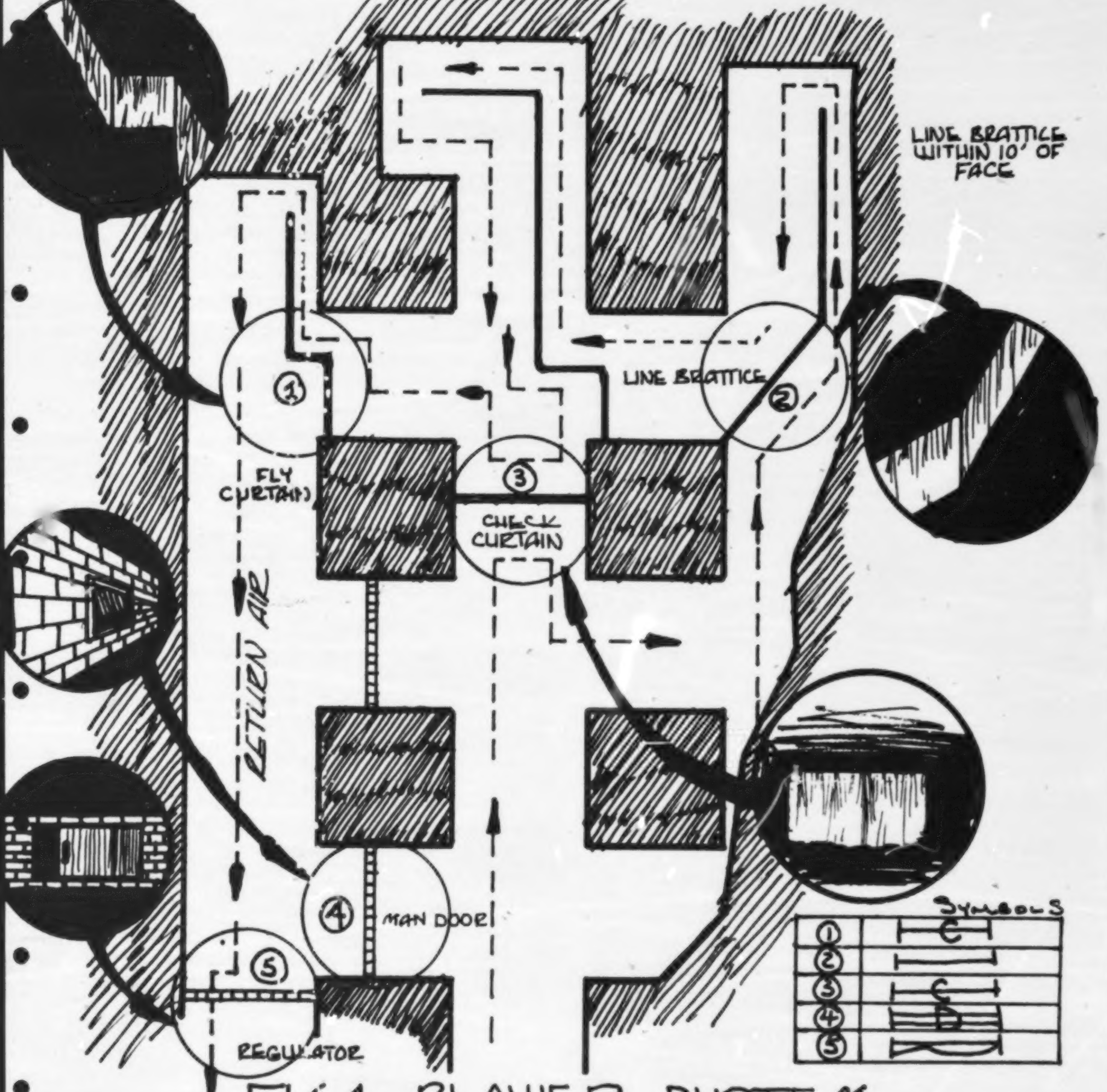
LINE BRATTICE WITHIN 10' OF FACE
LINE BRATTICE
①
FLY CURTAIN
②
③
CHECK CURTAIN
RETURN AIR
④
MAN DOOR
⑤
REGULATOR
SYMBOLS
①
C
②
③
C
④
D
⑤
R

FIG.1 BLOWER SYSTEM

and blows dust from face cuttings over the machine operator. Also, when transporting coal from the face to the loading point, check curtains or door must be used to pass through.

Exhaust method --- Air is directed to the face through the larger division of the heading and led away from the face by passing between the line brattice and the nearest rib. See fig. 2.

This method blows the dust away from the machine operator, eliminates the need for check curtains or doors and carries methane from the face directly into the return. But the exhaust method does not dilute methane as effectively and the installed ventilation system is more difficult to maintain. The line brattice must be firm to withstand the ventilating pressure and must be kept nearer to the face.

COMBINATION BLOWER AND EXHAUST SYSTEM

The effectiveness of this system, (which combines the best of both methods) in diluting methane depends on the fan capacity and tubing position. The exhaust inlet must be as near the face as is practical and maintained by the blowtubing outlet. See fig. 3. The fans must be unbalanced; one fan supplying greater capacity. Methane may collect between the face and machine head when full-face, fixedhead and continuous miner is used. All gases and dust should flow into return air courses.

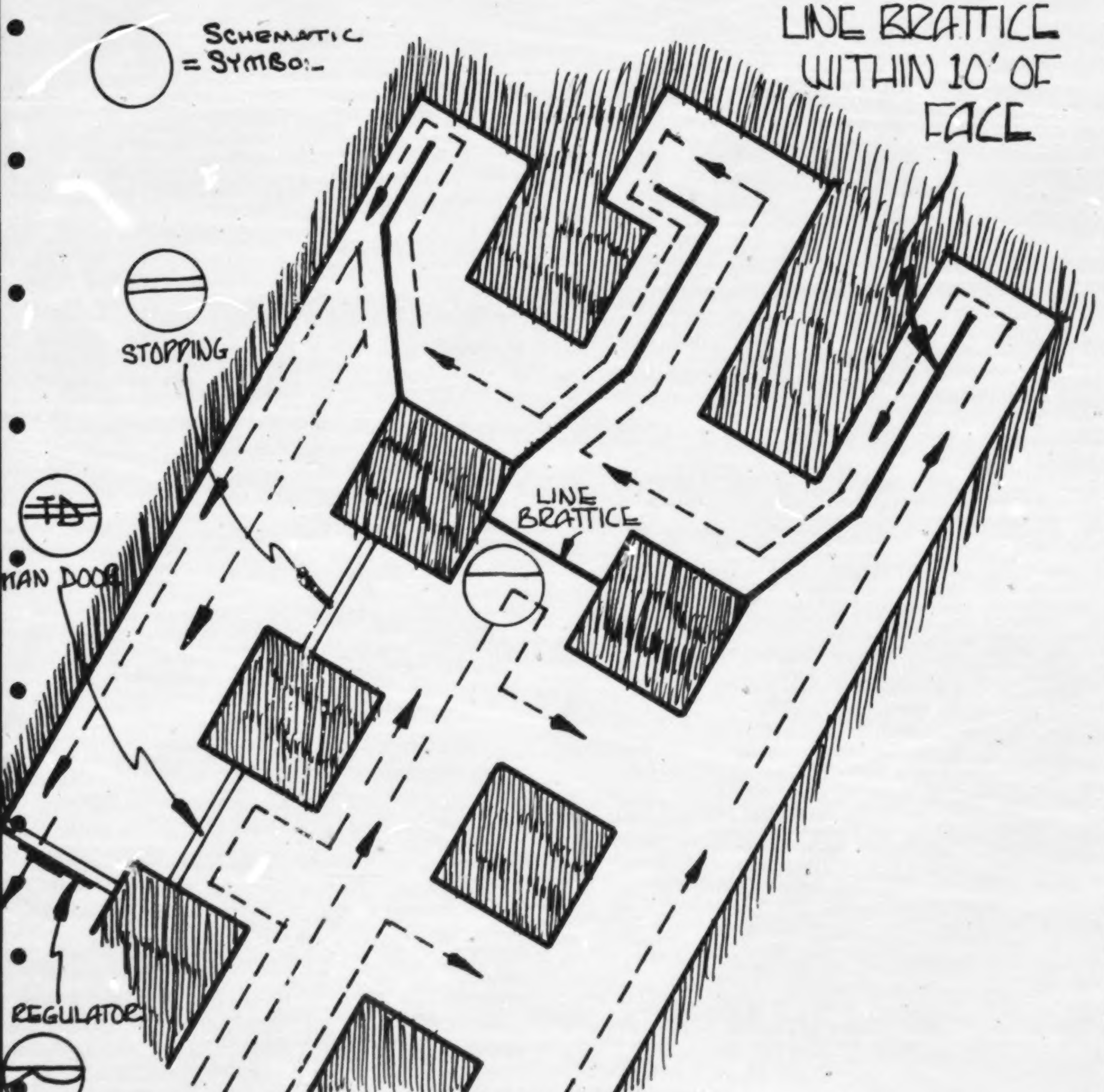
SCHEMATIC
= SYMBOL
LINE BRATTICE
WITHIN 10' OF
FACE
STOPPING
TD
MAN DOOR
LINE
BRATTICE
REGULATOR
R

FIG.2 EXHAUST SYSTEM

PROGRAM D-2 UNIT NO. 06 MODULE NO. 02 TASK NO. 050

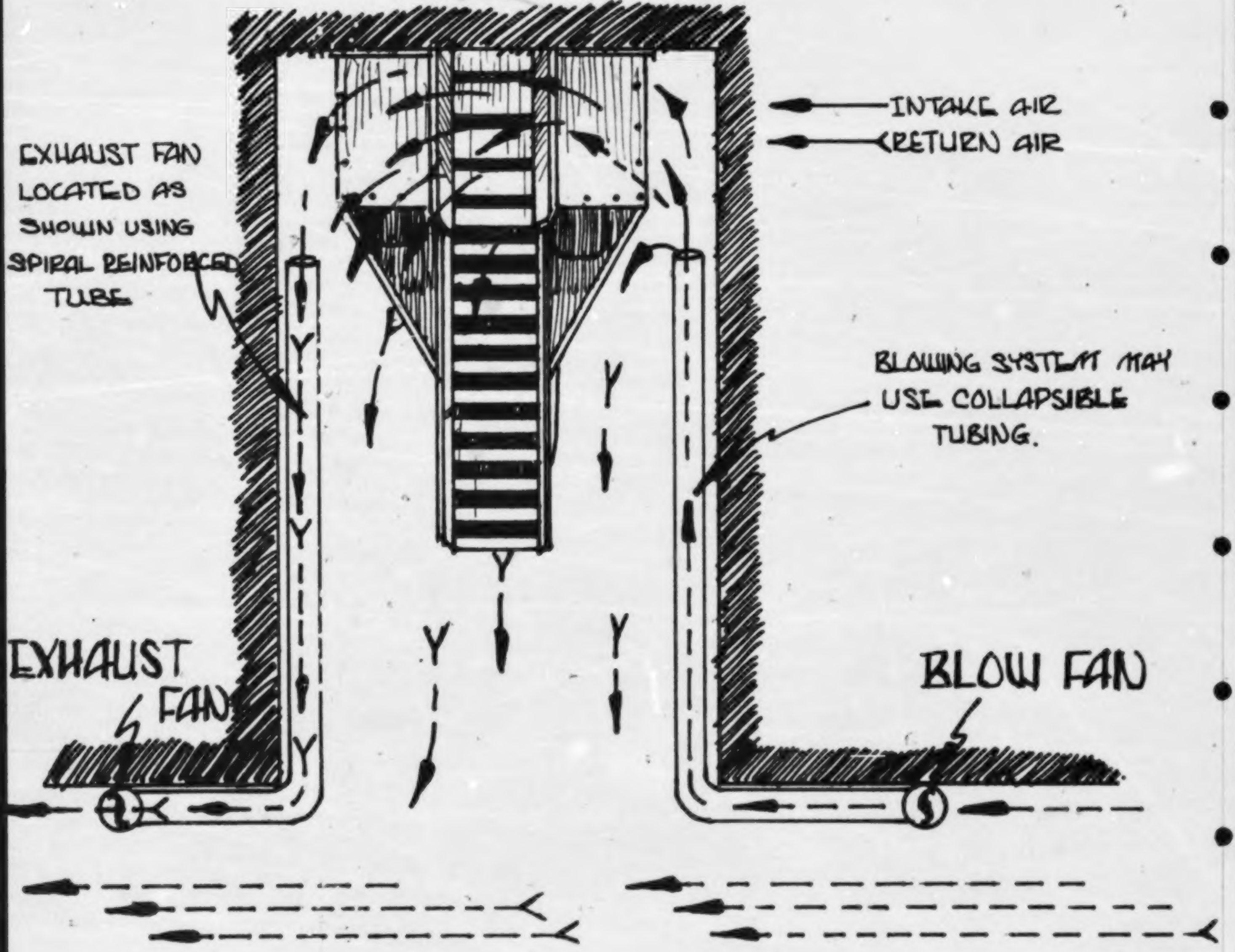
INTAKE AIR
RETURN AIR
EXHAUST FAN LOCATED AS SHOWN USING SPIRAL REINFORCED TUBE
BLOWING SYSTEM MAY USE COLLAPSIBLE TUBING.
EXHAUST FAN
BLOW FAN

FIG. 3 COMBINATION BLOW & EXHAUST SYSTEM

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ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
UNIT 06 MODULE 03 TASK 010
DATE COMPLETED

STUDENT NAME
INSTRUCTOR
INSTRUCTOR'S INITIALS

TASK TITLE: *Anemometer.*

Objective:
The student will show he knows the who, what, where, when and why about a anemometer by answering the review questions to 80% accuracy.

Procedure:
1. Read the objective more than once.
2. Study the information sheet and illustrations.
3. Answer all review questions.

Review Questions:
1. Who tests the air current in a mine?
2. What is an anemometer?
3. Where is the velocity measured?
4. When is it necessary to test the velocity of air in a mine?
5. Why is it necessary to know the velocity of flowing air in a mine?

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REVIEWED & APPROVED
RESEARCH
INSTRUCTOR
ADMINISTRATION

PREPARED BY: Mr. Wayne Farabaugh

PROGRAM D-2 UNIT NO. 06 MODULE NO. 03 TASK NO. 010

INFORMATION SHEET

The velocity, or speed of moving air, is important when determining the amount of air flowing through a mine, a major factor in the ventilation of a mine. The anemometer is the most popular, approved instrument used to measure air travel in lineal feet in todays mines.

The anemometer used in the mine is made of a metal ring with rotating blades inside connected to dials. As with a windmill, when the air hits the blades and spins, and the number of revolutions or complete turns, is shown on the dials. See fig. 1.

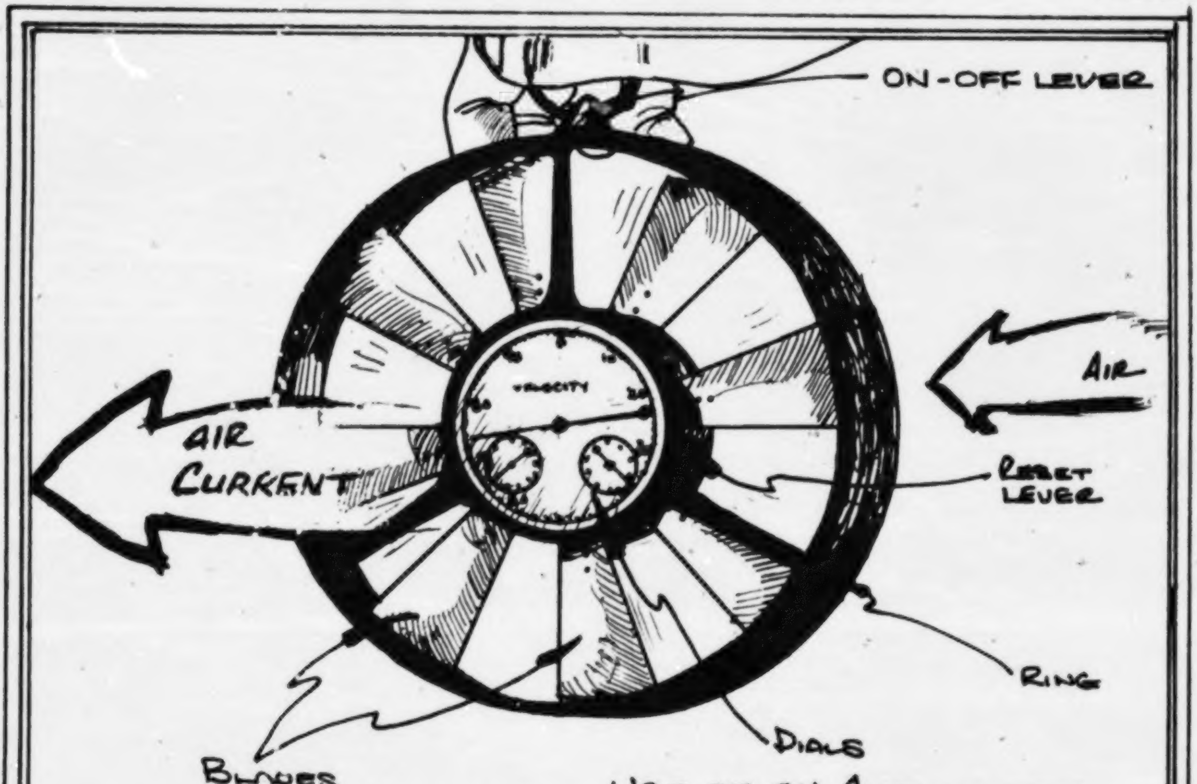
Federal law (75.303-1) states that the mine examiner will use an anemometer or an approved device to measure the velocity and determine the volume of air at these locations:

1. The last open crosscut of each pair or set of developing entries;
2. The last open crosscut of each pair or set of rooms;
3. The intake end of each pillar line;

Or any area in the mine, active or otherwise where persons are permitted to enter.

Federal law (75.301-4) states that the minimum mean entry air velocity will be 60 feet a minute in all working places using mechanical mining equipment or otherwise designated.

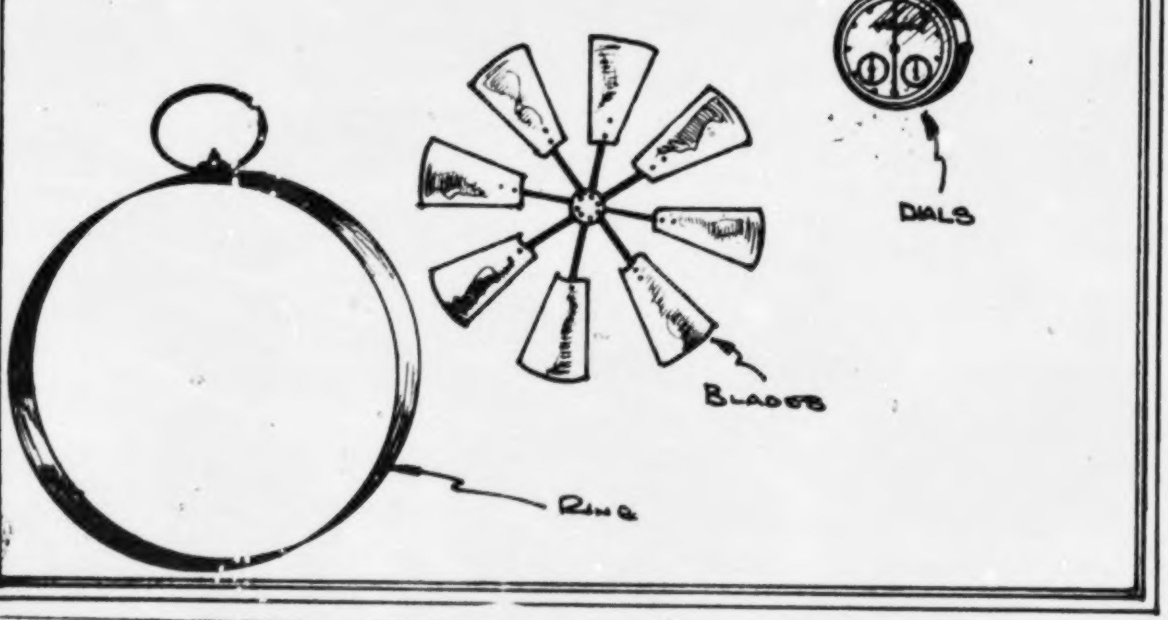
According to Federal law (75.303), these examinations will be made within 3 hours before the beginning of any shift. The examiner will initial, date and place the time at all places he examines and also record the results in a book kept in an outside office.


ON-OFF LEVER
AIR
AIR CURRENT
VELOCITY
RESET LEVER
RING
DIALS
BLADES

USE OF AN ANEMOMETER

FIG. 1

EXPLODED VIEW


DIALS
BLADES
RING

INFORMATION SHEET

HOW TO HANDLE AN ANEMOMETER

When handling an anemometer, DO NOT --

Touch the blades
Oil the bearings
Expose the anemometer to higher velocities than it was designed for.

The anemometer should be calibrated by the manufacturer every six months. Any repairs should be made by the manufacturer.

STEPS FOR USING AN ANEMOMETER

1. Hold the anemometer at arm's length in the center of an obstruction-free airway for 1 minute. See fig. 1.
2. Reset the dials to '0' with the reset lever.
3. Face the direction the air is flowing so it hits your back or right side. (Air must enter through the back side of the instrument.)
4. Keep hands and fingers out of the air flow. (See fig. 2) If they do block the flow or touch the blades, stop and start over.
5. Flip switch to ON to start dials and at the same time, time the sweep second hand on the watch for a full minute.
6. Flip the switch to OFF, and write down the dial readings.

HOW TO READ THE DIALS

Three Dial Type.
The big dial reads from 0 to 100, the small dial on the left, marked HDS, measures hundreds of feet and the small dial on the right, marked THDS, measures thousands of feet. (See fig. 3)

To read the anemometer --

1. Look at the right hand dial. Since the pointer is between 0 and 1, it has not reached 0 so the total reading will be less than 1,000 feet.
2. The pointer on the left hand dial is between 6 and 7 so since it has not reached 7, it is read as 6.
3. The large dial points to its true reading, 59.
4. The reading is taken by grouping all the readings in their proper order. Thus, 0 from the right dial, 600 from the left dial, and 59 from the large dial gives a total reading of 659.

ADMIRAL PEARY AREA VOCATIONAL TECHNICAL SCHOOL
EBENSBURG, PENNSYLVANIA 15931

PROGRAM D-2
STUDENT NAME
UNIT 06 MODULE 03 TASK 020
INSTRUCTOR
DATE COMPLETED
INSTRUCTOR'S INITIALS

TASK TITLE: *Use of the Anemometer.*

Objective:

Following the instructions and a demonstration by Instructor, the student will correctly measure and record the velocity of a designated mine area using an anemometer to the satisfaction of the Instructor.

Reference:

Demonstration by Instructor.

Tools:

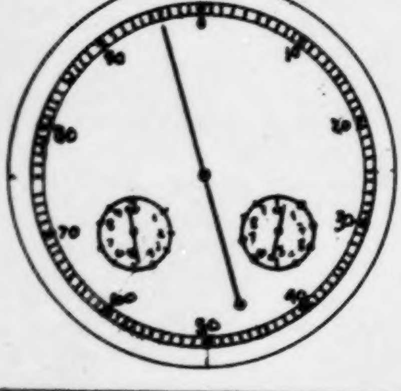
Anemometer
Wrist watch
Tape measure

Procedure:

1. Read the objective several times.
2. Demonstration by Instructor.
3. Study illustrations and information sheet.
4. Practice by answering the review questions.
5. Following the instructions, measure and record the velocity of a designated mine area using an anemometer.
6. Return the anemometer to its proper storage.

Review Questions:

1. What is the reading on the following anemometer?



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REVIEWED & APPROVED
RESEARCH
INSTRUCTOR
ADMINISTRATION
PREPARED BY: Mr. Wayne Farabaugh

INFORMATION SHEET

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The anemometer should be calibrated by the manufacturer every six months. Any repairs should be made by the manufacturer.

STEPS FOR USING AN ANEMOMETER

1. Hold the anemometer at arm's length in the center of an obstruction-free airway for 1 minute. See fig. 1.
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4. The reading is taken by grouping all the readings in their proper order. Thus, 0 from the right dial, 600 from the left dial, and 59 from the large dial gives a total reading of 659.

PROGRAM D-2 UNIT NO. 06 MODULE NO. 03 TASK NO. 020

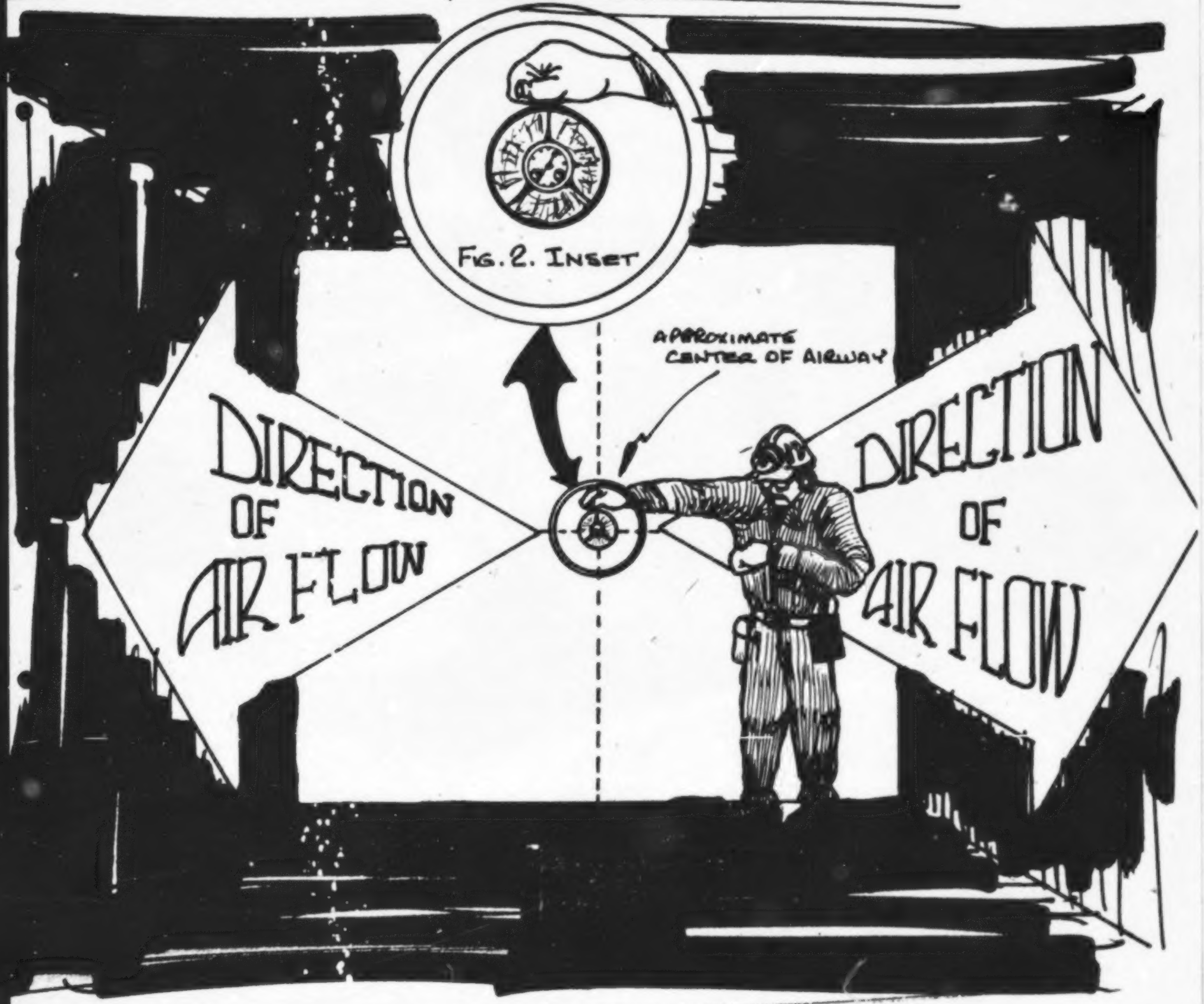
Fig. 2. Inset
Approximate center of airway
Direction of air flow
Direction of air flow

Fig. 1 Correct Use of An Anemometer

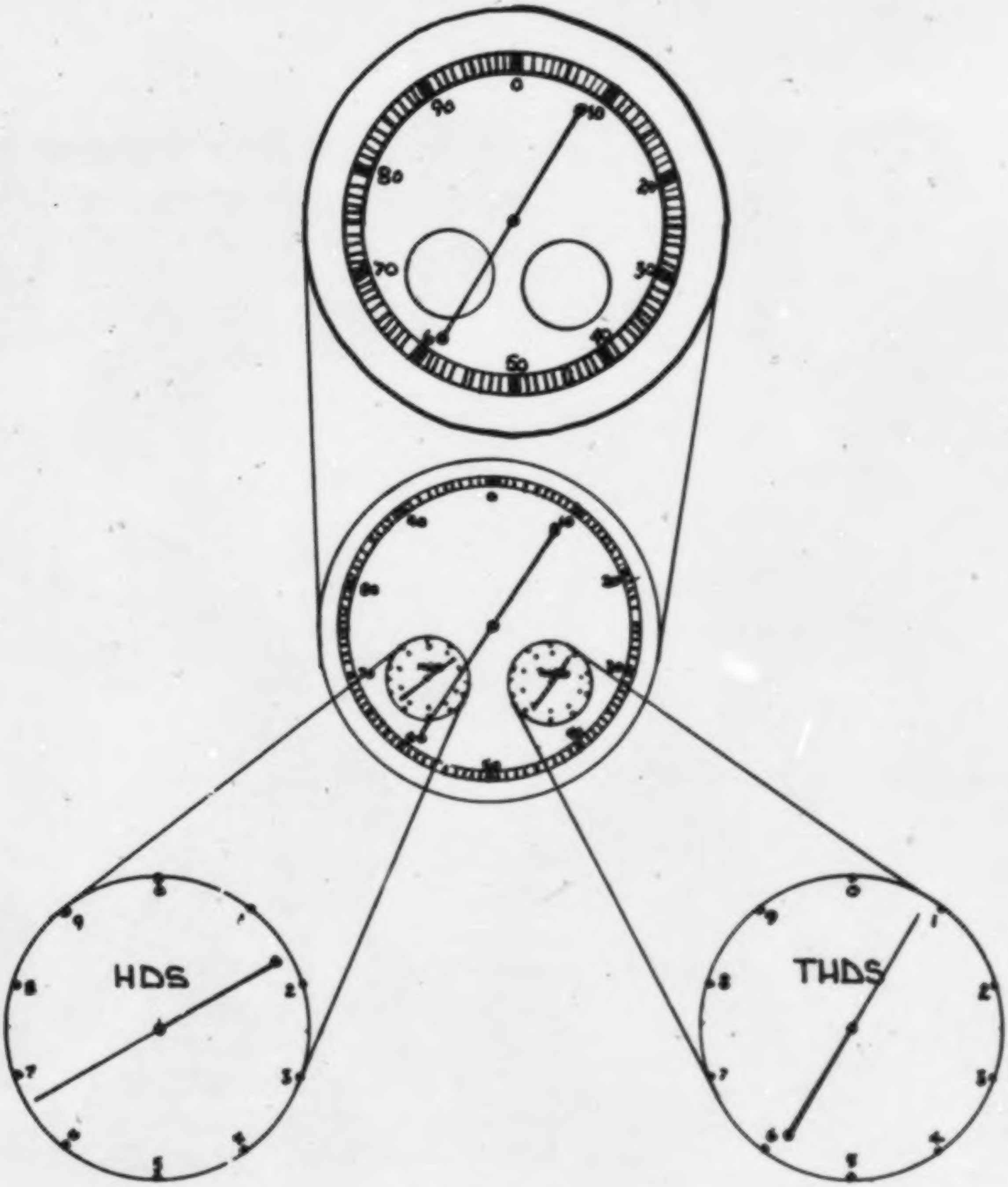
0
10
20
30
40
50
60
70
80
90
HDS
THDS
0
1
2
3
4
5
6
7
8
9

FIG. 3 READING A THREE DIAL ANEMOMETER